SCIENTIFIC AMERICAN

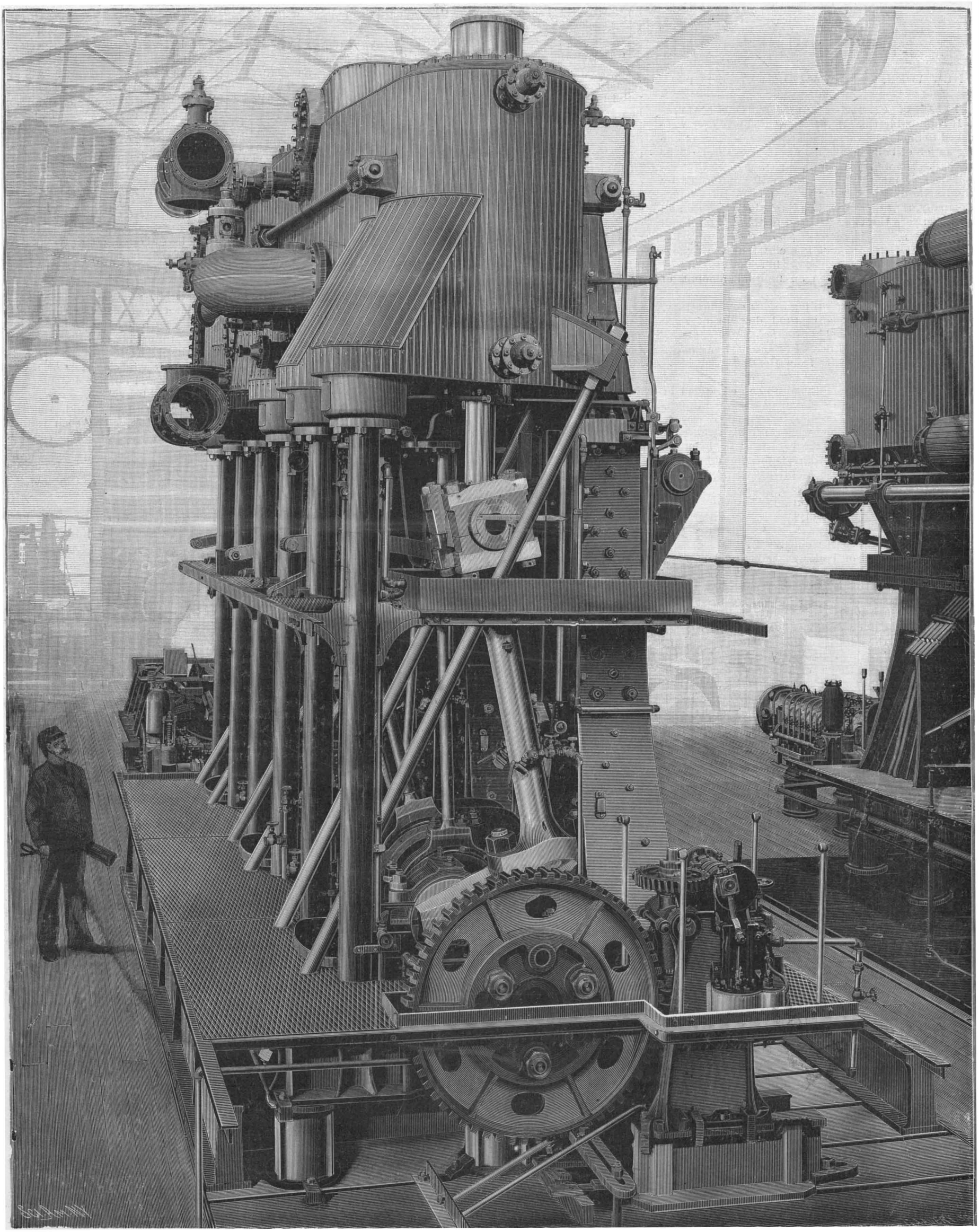
[Entered at the Post Office of New York, N Y.. as Second Class Matter. Copyright, 1899, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXXI.—No. 25. ESTABLISHED 1845.

NEW YORK, DECEMBER 16, 1899.

$3.00 A YEAR. WEEKLY.



ENGINES OF THE FIRST-CLASS BATTLESHIP "WISCONSIN."—[See page 389.]

Cylinders: HIGH PRESSURE 33½ inches, INTERMEDIATE 51 inches, LOW PRESSURE 78 inches diameter; STROKE 48 inches. **Working Pressure,** 180 pounds. **Horse Power,** 11,000.

© 1899 SCIENTIFIC AMERICAN, INC.

Scientific American.

ESTABLISHED 1845

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS TO SUBSCRIBERS

One copy one year, for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845).....$3.00 a year.
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Edition (Established 1885)..... 2.50 "
Scientific American Export Edition (Established 1878)..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner Franklin Street, New York.

NEW YORK, SATURDAY, DECEMBER 16, 1899.

RELATION OF RAINFALL TO BOILER SCALE.

It is probable that if the average steam user were asked to name the various contributory causes of the formation of boiler scale, he would stop short of the rainfall. Yet we have it on the authority of that excellent little monthly, The Locomotive, published by the Hartford Steam Boiler Inspection and Insurance Company, that there is a direct relation of cause and effect between the two. The unusually light rainfall of the past season in many parts of the country has been a matter of note, and it seems that the reports turned in by the boiler inspectors in regions so affected show that there has been an unusual amount of trouble from scale.

The reason for this, according to our contemporary, is not hard to find, the unusual deposits of scale being due to the increased hardness of the water after a lengthy spell of dry weather. In times of drought the water is drawn necessarily from the lower levels, in reaching which it has become impregnated with lime, magnesia and other soluble substances contained in the overlying strata. In a season of copious rainfall, on the other hand, the ground, being soaked, cannot absorb the surface water, which rapidly drains off into rivers or reservoirs, as the case may be, before it has had time to dissolve out the scale-forming substances in any quantity. In a season of light rainfall, like the present, the ground can absorb practically all the water that falls, and the proportion of surface water is relatively small. Hence, in dry seasons the water used in the boilers will be largely spring or hard water, and in wet seasons it will consist chiefly of surface or soft water, the deposits of boiler scale being larger or smaller in proportion.

The moral of all this is twofold. In the first place, during a dry season boilers should be more frequently opened, examined and cleaned. Just how much oftener this should be done must depend upon local conditions and the severity of the drought; but it is suggested that, judging from observations made in the State of Connecticut, they should be inspected in such a season as the last about twice as frequently. Another fact to be remembered is that when a heavy rainfall comes, bringing a sudden supply of surface and therefore soft water, the scale that is in the boiler will be suddenly loosened up, and unless precautions are taken it will lodge over the fire-sheet and cause trouble. This is particularly liable to happen during the melting of the snow in the spring, when the water will be particularly free from mineral salts.

OPENING OF THE NEW ST. LAWRENCE CANAL LOCKS.

An event which will be of great importance in the development and expansion of the commerce of the Great Lakes is the opening of the new St. Lawrence canal locks. Our readers will remember that when the United States government wished to bring the revenue cutters "Algonquin," "Gresham," and "Onondaga" from the lakes to the Atlantic, to assist in the Cuban operations, it was found necessary to cut the vessels in two and float them through the St. Lawrence locks in sections. Now, although these little craft are only 205 feet in length, they were about 20 feet too long to be admitted, the old lock being unable to accommodate a vessel over 186 feet in length. The operation was not without its risks, as was proved by an illustration published in the SCIENTIFIC AMERICAN of July 2, 1898, showing one of the sections of the "Gresham" capsized in the attempt to make the passage. The new locks are capable of admitting vessels up to 270 feet in length, and the arrival recently of the "Porto Rico," a vessel measuring 250 feet over all, at New York, after making a successful passage from the Great Lakes, indicates that the direct result of the venture will be the shipment of freight direct from the lakes to various points on the Atlantic seaboard.

It has been suggested that these improved facilities, which are entirely under British control, will operate to the naval disadvantage of this country, for the reason that the greater size of the locks will permit a considerable number of the larger gunboats and smaller cruisers of the British navy to enter the Great Lakes, whereas by the treaty of 1814 the shipbuilding yards on the lakes are prevented from the construction of warships. Although the excellent relations existing and likely to continue between the two governments render it unlikely that this strategic advantage will ever be put to the test, it is probable that, as suggested in the President's message, the restriction to warship construction on the lakes will be removed by mutual agreement. The advantage to shipbuilding interests on the lakes from such a change would be considerable, for there are many smaller vessels, such as the twelve 1,000-ton gunboats, proposed by the Naval Board, which under the new conditions could be built on the lakes and then brought to the seaboard through the new locks.

"THE WISH IS FATHER TO THE THOUGHT."

A correspondent in Japan writes us that the following paragraph, taken from The Daily Mail, has been published with apparent delight by a number of English journals in China and Japan, special prominence being given to it in The Japan Mail: "The chairman of the Midland Railway Company was able yesterday to make the highly satisfactory announcement that the American engines which were purchased by that company do not compare at all well with the British-made locomotives. As we have often had to draw attention to the inroads which the United States are making upon our trade, it affords us pleasure to give prominence to this evidence. This is probably the first occasion on which American engines have been fairly tested against British ones upon a high-class road, and the world, we hope, will note the result!" Our correspondent writes that Americans in the East would like to hear the other side of the story, and be assured whether the chairman of the Midland Railway made the unqualified statement that the American engines do not compare at all well with British-made locomotives.

After making careful inquiries both here and in England, we can assure our correspondent that the item referred to is one of those half-truths that are worse than falsehood. Whether the misrepresentation is willful or not, there is no doubt that "the wish is father to the thought." What the chairman of the Midland Company did say was as follows: "With regard to these first ten Baldwin engines, they are at present working on the line, and Mr. Johnson, our locomotive superintendent, says that although they are not by any means up to the finish of locomotives that are made in this country, *they are doing their work satisfactorily*." We have ourselves italicized the last clause, which was omitted by The Daily Mail for the evident purpose of making the chairman seem to condemn, where he actually indorses, the work of the American locomotives.

We are not in the habit of correcting misstatements that occur in the daily press; but the present instance is so purposely misleading, and as our correspondent informs us, the false impression is being so industriously spread abroad in the very countries in which American engines are gaining a secure foothold, as to call for emphatic contradiction. The statement of Mr. Johnson that the new locomotives were doing satisfactory work was made in August. In the intervening three months the whole of the order has been filled by the Baldwin Company and sufficient time has elapsed for a fairly thorough test to be made. The results continue to be strongly in favor of the American locomotive. The engineers who are running the engines report that not only are they hauling the same trains as the English engines upon the same average coal consumption, but they have proved to be capable of drawing much greater trains, and would now be doing so were it not for the fact that the sidings at the English stations are too short to admit longer trains. Hence the American engines cannot be given trains of the maximum weight at which they can show to the best economic advantage, and the fact that they compare favorably with the English engines under conditions that are more favorable to the latter speaks volumes for the American type.

It is urged that the English engine is more durable—a claim that can only be established after a test extending over a lengthy period; but we note that Mr. Ivat, locomotive superintendent of the Great Northern Railway, for which twenty Baldwin locomotives were recently constructed, says: "I have been examining them, and I cannot find any important part that ought not, with fair usage, to last as long, or nearly so, as those of our own engines." In addition to the ten Baldwins, there were ten engines furnished by the Schenectady Works. Regarding these, we are informed that the company has received "very favorable reports," the operation showing the same satisfactory results as have been achieved by the Baldwin locomotives.

The Midland Company is keeping a careful log of the relative performance of the two types, realizing that they have a valuable opportunity to determine the efficiency of the more roughly finished, less expensive, but harder worked American locomotive as compared with the more highly finished, supposedly more durable and certainly more expensive and generally easier worked English engine. There is no doubt that the test will be fairly conducted and the results made known without reserve. If, after taking all the questions which determine economy into consideration, such as first cost, hauling capacity, fuel and oil consumption, repairs, and length of useful life, the American machine proves to be more economical, the English locomotive builders will find that the battle for supremacy is on in earnest, and that in their own exclusive territory.

TUNNELS VERSUS BRIDGES FOR RAPID TRANSIT.

The craze for building bridges, and $15,000,000 bridges at that, which has taken possession of the gentlemen who just now control the expenditures of the city of New York, was forcefully rebuked by the controller at a recent meeting of the Board of Estimate. About a year ago the Board committed itself to the construction of two bridges, between Manhattan Island and Brooklyn, one of which is to cost $15,000,000 and the other $13,000,000. A sum of $50,000 was voted at the time for the preliminary expenses, and at the next meeting of the board a resolution was introduced authorizing a bond issue of $2,000,000 on which to commence active operations. It was suggested by the controller in a very able address that action should be delayed in issuing bonds for construction, until the question of constructing tunnels in lieu of bridges could be thoroughly investigated. He presented reports upon the relative cost of tunnels and bridges, which had been prepared at his request by the Chief Engineer of the Department of Bridges, and the engineers of the Brooklyn Bridge and the new East River Bridge, which made out a strong case for the tunnels on the question of first cost and cost of maintenance.

It was stated that the tunnel beneath the East River constructed to carry the mains of the East River Gas Company is 10 feet 6 inches in diameter, or several inches larger than the City and South London tunnel, which is daily carrying a heavy passenger traffic. This tunnel according to the report could be duplicated to-day for less than $500,000, or two such tunnels, one for east and one for west-bound traffic, could be built for about $900,000.

A report put in by the firm who built the tunnel under the East River used by the New Amsterdam Gas Company stated that a double-track tunnel to carry the same number of passengers as could be carried on the proposed Manhattan Queens Bridge could be built for $1,900,000, whereas the bridge is to cost $13,000,000; and another tunnel, to take the place of the Manhattan-Brooklyn Bridge, would cost only $2,500,000, as against a cost of $15,000,000 for the bridge.

Another feature named by the controller was the great rapidity with which tunnels can be constructed, the East River gas tunnel having progressed at the rate of 100 feet per week. From this it is concluded, that a tunnel between Brooklyn and New York could be completed in two years from the letting of the contract. It was further pointed out that the great height of the bridges above the river called for costly condemnation of private property to provide for the approaches, whereas tunnels can be kept within the line of the city's streets; and, furthermore, that tunnels are not tied down by consideration of topography to particular locations, but may be located with a sole view to meeting the requirements of traffic.

While there is no disputing the broad truth of these arguments, they somewhat overstate the case in favor of the tunnels, and omit to mention compensating features in the bridges. On the question of cost there cannot be two opinions—the tunnel is cheaper. But it is not so much cheaper as Mr. Coler supposes; for, like the bridge, it must have lengthy approaches, which, in the very nature of things, will require condemnation of property to make room for terminals; unless, indeed, it is proposed to dispense with terminals altogether and connect direct with the underground system. Then, again, it is somewhat misleading to draw a parallel between a two-track tunnel accommodating railway cars only and a vast thoroughfare such as will be the new East River Bridge, with two steam railway tracks, two trolley tracks, two wagon roads, two broad sidewalks for foot passengers, and in all probability two separate tracks for bicycles. It would take at least four two-track tunnels to provide the same traffic capacity as this huge bridge with its clear width of 118 feet, and four such tunnels would cost not less than $10,000,000, without any allowance being made for the approaches to accommodate trolley, wagon, and foot-passenger traffic. The object of the new East River Bridge, as stated at the time of its commencement, was to provide a broad thoroughfare across the river over which the surface, elevated, wagon, and foot-passenger travel might pass without interference of terminals or grades.

It seems to us that the situation can best be met by the provision of both bridges and tunnels, the former to connect the elevated and surface roads and the latter to unite the new underground system with the various transportation systems of Brooklyn. One of the

© 1899 SCIENTIFIC AMERICAN, INC.

two proposed bridges would suffice for the present, and the $15,000,000 it is proposed to spend for the other could be used to better advantage in the construction of three or more tunnels of the kind suggested.

OUR EXPORTS OF IRON AND STEEL.

The most gratifying feature in the growth of the iron and steel trade of this country is the fact that a rapidly increasing proportion of the product of our furnaces and mills is being shipped abroad. In spite of the greatly increased demand at home, due to the present era of prosperity, and despite the steady rise in prices, our exports continue to grow at an increasing rate. The first ten months of the present year show an increase over the corresponding months of 1898 of about $20,000,000, bar iron exports, for instance, having increased in quantity by 100 per cent, steel rods by 30 per cent, and steel sheets and plates by over 100 per cent; the greatest increase being in wire nails, of which we sold nearly 200 per cent more than in the preceding year. Thus our exports of wire for ten months rose from 135 million pounds in 1898 to 219 million pounds in 1899; steel sheets from 48 to 109 million pounds, and wire nails from 24 to 56 million pounds. The largest increase in value was in the exports of machinery, which rose in value from 12 million to 15 million dollars; builders' hardware coming next, with an increase from over 5 million to over 7 million dollars. The total value of iron and steel exports was for 1898, $67,290,560; and for 1899, $86,162,258. The present indications are that we shall sell to the outside world over $100,000,000 worth of iron and steel and manufactures therefrom for the whole calendar year.

TROPICAL PRODUCTS OF OUR NEW POSSESSIONS.

The commercial possibilities which await the tropical island territories which have come into closer relationship with the United States during the past year in supplying a permanent and growing market in this country are suggested by the figures which the Treasury Bureau of Statistics has obtained of the importation of tropical and sub-tropical products into the United States during the ten months of the present year, compared with that of the corresponding months of the preceding year. They amount to no less than $280,000,000, or an average of over $1,000,000 for each business day of the year. The figures include raw silk, tea, rice, and the small portion of sugar which is manufactured from beets; but even if these be omitted, the total which would be clearly entitled to be classed as tropical products would exceed $250,000,000 annually, including sugar, coffee, India rubber, fibers, tropical fruits and nuts, cacao, tobacco of finer grades, spices, dye woods, cabinet woods, etc. Curiously enough, all these articles can be and are now produced to a greater or less extent in the islands in question, sugar cane being grown in large quantities in Cuba, Porto Rico, Hawaii, and the Philippines. Coffee is successfully grown in all of the islands in question and at one time was a very important crop in Cuba as at present it is in Porto Rico, Hawaii, and the Philippines. Fibers of which the importations in the present year will amount to $20,000,000 in value can be readily grown in all of the islands. The Philippines are already supplying the most important feature of our fibers, Manila hemp, which alone in the present year will amount to about $6,000,000 in value.

THE AUTOMOBILE CUP.

The cup which has been recently presented to the Automobile Club, of France, by Mr. James Gordon Bennett is to inaugurate a series of yearly international contests between the different clubs of Europe and America, the winning club to hold the cup until beaten, as in the yacht races. This will form a yearly event which promises some interesting sport, as there is no doubt that the cup will be warmly contested by the different clubs. It is now in possession of the Automobile Club, of France, who will hold it until the first contest decides the winner. A series of rules have been established for the conduct of the races; the following is a résumé of them:

The cup may be competed for by all the clubs now on the official lists, which includes those of Belgium, Austria, Italy, Great Britain, Germany and the United States. Any club not on this list may be accepted by a majority of the clubs above named. To enter the competition, a letter should be addressed to the president of the club holding the cup, in which will be stated the number of vehicles to be entered, and other necessary details. The time fixed for the races is from the 15th of May to the 15th of August. Each club may send from one to three automobiles, these to belong to the class known as "voitures," as specified in the rules of the Automobile Club, of France, for 1899. According to this they should weigh, empty, more than 400 kilogrammes, and carry at least two persons, these placed side by side. A weight of 70 kilogrammes is allowed per person, this being regulated by the addition of ballast, as usual, to make up the 140 kilogrammes total. The 400 kilogrammes, representing the weight of the vehicle empty, is exclusive of combustibles, accumulators, water, baggage, etc. One of the rules is that all the automobiles entering the contest should be constructed in the countries represented by the different clubs. They are to be conducted by members of these clubs, the two places being occupied during the whole time of the race.

A committee of supervision is to be formed, and for this each club will be represented by a delegate; the donor of the cup is an honorary member of this committee. The necessary officers will be appointed, and also the starters, judges, timekeepers, etc.; these latter are not necessarily chosen from among the members. The races will be run over a route of 550 to 650 kilometers, with stages of not less than 150; they are to take place in the country whose club holds the cup for the year in question; if desired by this club, the races may be held in France, starting presumably from Paris. This will no doubt be carried out in a number of cases, on account of the fine roads in that country and from the fact that Paris, besides being a local center, has all the facilities for the care of automobiles.

Among other rules the most important is naturally that which concerns the winning of the cup; this is decided by the automobile which first crosses the line, and the club it represents will be declared victor. All communications in regard to these contests may be addressed to the secretary of the Automobile Club, of France, Place de la Concorde, Paris.

ANCIENT EGYPTIAN PORCELAIN.

It has often been a subject of question as to whether a veritable porcelain has ever been made by the Egyptians, the term including products which shall be compact and translucent. The French savant Brogniart, in his treatise on ceramics, concludes that all the samples of porcelain found in Egypt are of Chinese fabrication. M. Le Chatelier has lately made some interesting researches in this direction and has presented his results to the Academie des Sciences. Among the samples given him by an archæologist he has found a fragment of a funerary statuette coming from Saggarah, which he pronounces to be undoubtedly of porcelain; its hieroglyphics leave no doubt as to its fabrication in Egypt. The paste is translucent and of a pale blue color; in composition it presents marked differences from that of china. It is a veritable soft porcelain, its blue color being due to the addition of a small amount of copper. The experimenter has been able to reproduce a substance which resembles this very closely by making a paste of ground sand, 55 parts; white clay, 5 parts; and a special blue glass, 40 parts. This latter was made up according to the formula—

$$3{\cdot}3\ SiO_2,\ 0{\cdot}23\ CaO,\ 0{\cdot}13\ CuO,\ 0{\cdot}64\ Na_2O.$$

This paste when baked at a temperature of 1,050° C. yields a pale blue mass which turns to green when the temperature is raised above 1,200°. It is to be remarked that by reason of the feeble proportion of clay in the composition, the wet paste is plastic only in a feeble degree and for this reason could not be used for molding objects except those which took a compact form, such as the statuettes referred to.

RAILWAY SAFETY APPLIANCES.

The Interstate Commerce Commission, on December 6, gave a hearing to the representatives of the several railway companies, asking for a further extension of the time allowed them to equip their lines with safety appliances, under the act of March 2, 1893. Two years ago the Commission granted an extension until January 1, 1900, and the present extension desired is one year. Representatives of a hundred railways were in attendance, as were also representatives of labor organizations. The President of the Baltimore & Ohio Road, acting as chairman, representing eighty-eight other roads, having 80,000 miles of line, made the opening argument. He said that on June 1, 1899, 211,268 freight cars out of a total of 2,268,000 engaged in interstate commerce were not equipped with safety appliances, but since that time the number has been reduced to between 150,000 and 175,000. He stated that the railroads had done as well as could be expected, and some of the cars not equipped were so old that they would go out of service within the coming year, and the present withdrawal of 175,000 unequipped cars would practically paralyze interstate commerce. Other railroad officials also spoke, advocating an extension of time.

"ADVANCE SHEETS" OF THE GERMAN CONSULAR REPORTS.

To satisly the numerous demands from German manufacturers, exporters and Chambers of Commerce, for an improvement in the information service of the German Consular Bureau, the Imperial Government has recently begun to publish pamphlets containing extracts from Consular Reports and other interesting matter. It is entitled "Advices for Commerce and Industry," and is something between the daily "Advance Sheets" issued by our Department of State and the monthly "Consular Reports." It is very gratifying to know that our Consular Reports and methods are considered abroad to be worthy of emulation.

NEW YORK'S TRADE IN WILD ANIMALS.

With the approach of cold weather all wild animals move into their winter quarters, and following the custom of their class the animals held in captivity in museums and circuses take up their abode in warm, steam-heated cages prepared for them. During the summer months many of them have been traveling about the country on exhibition, and others have been browsing in the numerous parks and private summer menageries just outside of large cities. The demand for wild animals for small parks in summer is quite general, and dealers in wild creatures make quite a fair profit in renting them out during the dull season. But as winter approaches, most of the animals return to the cities for exhibition in their regular quarters, where an eager public is always willing to pay a small fee to gaze at them.

The trade in wild animals has been unusually brisk for several years now, and the importations have steadily increased. In spite of this, however, prices instead of advancing for most of the animals have fallen; the reason for this is attributed to the fact that expeditions for capturing wild animals in their natural homes are more numerous than ever before, and they are better equipped for their work than in the past. Consequently more wild animals of nearly every description come to the civilized countries in captivity than in the days of Nero, when imperial Rome boasted of thousands of wild animals caged in its confines. While it is generally reported that many of our wild beasts are rapidly being exterminated, it is nevertheless true that they will never become extinct so long as their kind can be bred in captivity. This is now an accomplished fact with nearly all of the birds and animals.

This success of breeding in captivity is noticeable among lions in particular, and from present indications there is little danger of these felines becoming extinct. The importation of lions has almost ceased because it is cheaper and easier to breed them in captivity. Formerly an importer of fine lions could calculate upon getting $5,000 for a good specimen, but to-day young lions bred in captivity are almost a drug in the market. The only demand for imported lions is to keep up the stock of the breeding ones, or for very large, powerful creatures, for it is noticeable that the tendency in cage-breeding is for the animals to degenerate in size and ferocity. Tigers do not take as kindly to cage life as the lions, and they do not breed so satisfactorily in captivity, and considerable numbers are imported every year. Elephants do not breed well in captivity, not more than two or three ever having been bred in this country, but the importations of these animals is so large that the prices obtained for them have dropped from $10,000 to $1,500 to $2,500 each.

Numerous as monkeys are in this country, they are not bred here, as they do not breed well in captivity. They are so easily obtained in the country south of us, however, that prices obtained for them are merely nominal, and there is little danger of their immediate extinction. In their native countries they multiply so rapidly that the supply always keeps well up to the demand. Among the highest priced animals of to-day are the rhinoceros. There are quite scarce, and they do not breed in captivity. There are probably not more than half a dozen in number in this country; all were bought years ago at good round sums. Thus the full grown one in Central Park cost the department $7,000, and a similar sum was paid for the fine African specimen in the Philadelphia Zoo. The most recent purchase of a rhinoceros was the full grown one for Barnum's circus, which cost the proprietors $7,250.

The hippopotamus is another extremely rare and expensive creature, and sales of these African products are so few that it is difficult to quote a price for them. It is seldom that dealers have a good specimen to sell, and few private circuses could afford to give the prices that would be demanded. The hippopotamus born in Central Park is the only instance of these animals breeding in this country. Had this baby hippopotamus belonged to a private show, it would have made a fortune for its owners.

Snakes and birds form a large part of the animal importer's business. These creatures come in great numbers from India, Africa, and South America. The public is peculiarly fascinated by snakes, and they are among the most popular creatures exhibited. The best specimens of reptiles come from India, and a snake twenty feet or more in length is worth considerable money. In a cage it is the size of the snake more than its venomous qualities that attract, and a large boa constrictor or python is worth more than a rattlesnake of smaller size.

Exporting wild animals was formerly quite an extensive feature of the trade in these creatures, but owing to the scarcity of our large animals this feature of the business has fallen off. A young American bison can now be exported and sold for $1,000, and American elk, moose, and caribou have good market demands in Europe. Our Florida diamond-back rattlesnake and the alligator have a fair market demand abroad, and good specimens are occasionally shipped to foreign dealers to fill orders. G. E. W.

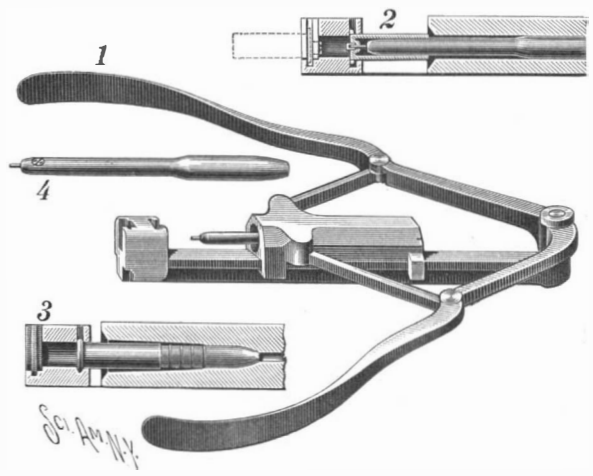
© 1899 SCIENTIFIC AMERICAN, INC.

A TOOL FOR RELOADING EMPTY CARTRIDGE SHELLS.

One of the simplest devices of its kind to which our attention has been drawn is an ingenious tool for reloading empty cartridge shells, which has been patented by Walter H. Gripman, of Sioux Falls, South Dakota. By means of the tool the old primer is rapidly expelled, a new primer accurately inserted, the shell and bullet resized, the mouth of the cartridge expanded, and the bullet securely fastened in the charged shell.

Fig. 1 is a perspective view of the device. Fig. 2 is a section showing the method of expelling the old primer and seating the new. Fig. 3 is a section showing the method of compressing the powder, crimping the shell around the bullet and resizing the cartridge. Fig. 4 is a side elevation of a pusher employed.

The tool is provided with guideways for a reciprocating die, operated by levers connected with links having a toggle action. The reciprocating die co-acts



A TOOL FOR RELOADING EMPTY CARTRIDGE SHELLS.

with a stationary die having an inner and outer retainer or guideway for the head of the shell. The two dies are provided with bores for receiving a pusher carried removably by the reciprocating die and provided with a detachable pin.

To remove the old primer, the head of the shell is placed in the inner retainer or guideway of the stationary die, as shown by the full lines in Fig. 2, so that the open end of the shell registers with the bore of the reciprocating die. When the levers are brought together, the pusher passes into the shell, and its pin forces the primer out into the bore of the stationary die; at the same time the beveled end of the pusher enlarges the shell mouth. The levers are now swung apart; the pin is removed from the pusher; a new primer is placed in position, and the head of a shell is placed in the outer retainer of the stationary die, as shown by the dotted lines in Fig. 2. The closing of the levers causes the pusher to pass through the stationary die and to seat the primer. The levers are again opened. The pusher is taken from its bore; the shell is removed and filled with powder, and a bullet is placed in position. The shell-head is then fitted in the inner retainer, as in the first instance, and the levers are closed, so as to cause the bore of the reciprocating die to crimp the shell upon the bullet, to compress the powder by forcing the bullet inwardly, and to resize the cartridge by contact with the wall of the reciprocating-die bore. In resizing the bullet the pusher is again used, without its pin, the cartridge being placed at the inner end of the bore of the stationary die and extended toward the reciprocating die. Hence, when the levers are closed the pusher forces the bullet through the bore, trimming off surplus material and grease, and giving the bullet the desired diameter.

African Transcontinental Telegraph.

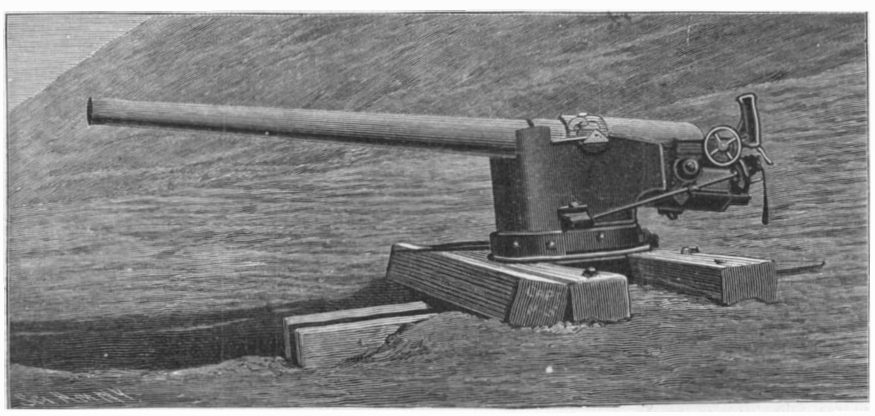
The construction of the African Transcontinental Telegraph Line, by which it was expected to unite the Cape with Alexandria across the whole of the continent, has been carried on with great activity, at least up to the time of the commencement of the hostilities in the south of Africa. The line has been finished up to a point midway between Lake Nyassa and Lake Tanganyika. From Karonga, a village situated at the northern end of Lake Nyassa, the line passes toward the northwest to gain the southern extremity of Lake Tanganyika. It will then follow the western shore of this lake and penetrate German territory, finally reaching Lake Victoria Nyanza, then Uganda, which is English territory. The construction of the line has been under the charge of 10 engineers, having 850 natives under their orders. A column of scouts chooses the best direction to follow, after which two relays of workmen trace the path and erect the posts, which are of hollow iron and conical shaped. The height of these posts is about 12 feet, and they weigh 170 pounds. The rear guard come after and stretch the wires, finishing the construction of the line. It is estimated that about 20 miles per day are thus constructed.

THE NAVAL GUNS AT LADYSMITH.

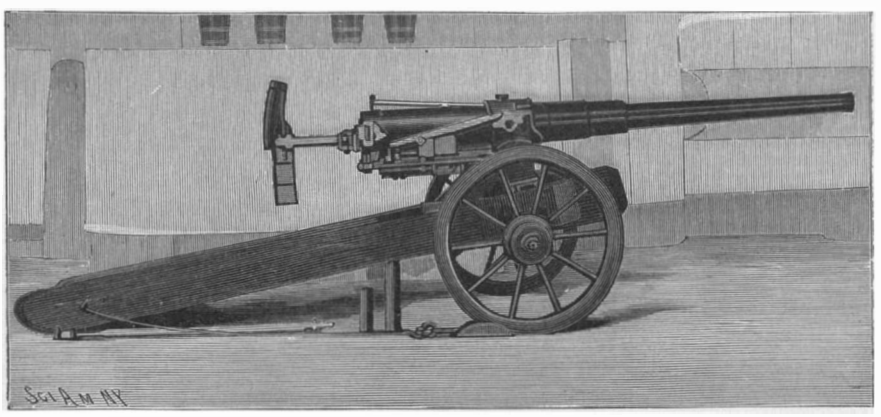
A great deal has been written in the past few weeks, or since the Boers completed the lines of investment around the town of Ladysmith, about the naval guns of H.M.S. "Terrible," which were rushed into the town at the last moment and are popularly supposed to have "saved it from destruction." These guns have been stated as being of various calibers, ranging from 3-inch up to 6-inch. As a matter of fact, they were of two sizes, four of them being the naval 12-pounder gun, of which the "Terrible" carries eighteen, and the other two being 4·7-inch rapid-fire guns, which must have been taken from one of the second-class cruisers on the South African station, as the "Terrible" does not include any guns of that caliber in her batteries.

As the methods of mounting guns on shipboard and for use in the field are entirely different, it was necessary to hastily improvise some form of field mounting for the navy guns which would serve the purpose. For the 12-pounder gun, which weighs 1,344 pounds, Capt. Scott, of the "Terrible," used a pair of heavy wagon wheels and a stout block of timber, the timber serving as a trail. The yoke which carries the trunnions of the gun was bolted securely to the timber, which was itself fastened to the axle of the wheels. A shoe-brake, which will be noticed in the accompanying illustration, was used for taking the recoil, the shoe being attached to the end of the trail by a length of wire rope. The four guns, as thus improvised, are much more powerful weapons than the 3-inch 12-pounders of the regular field batteries and the horse artillery guns, which weigh respectively 784 and 672 pounds. The former has a muzzle velocity of 1,574 feet and the horse artillery gun a velocity of 1,553 feet per second, whereas the naval gun, which is a much longer weapon, has a velocity of 2,210 feet per second. The extreme range of the regular field guns of the artillery is 5,000 or 6,000 yards, whereas these improvised naval guns have a range of 8,000 yards. The 4·7-inch rapid-fire guns fire a 45-pound lyddite shell with a muzzle velocity of 2,888 feet per second; and as its muzzle energy is about 1,500 foot tons, it can be seen that the question of providing a sufficiently secure mounting to withstand the recoil was a serious one. Capt. Scott overcame the difficulty by using several lengths of heavy 12 × 12 timbers. Two of these, 16 feet in length, were placed parallel with the axis of the gun; above these were bolted two other lengths of timber, and upon the platform thus formed was bolted down the baseplate of the regular mounting. One of the guns was fired with an elevation of twenty-four degrees and a range of 12,000 yards, and it was stated by an eyewitness that the effect on the platform was scarcely perceptible.

The valuable work which has been done by these guns is well known to the outside world, and while it is too much to say that they "saved Ladysmith," there is no question that they served very materially to keep down the fire of the Boer siege guns, among which there seem to be several long-caliber Canet pieces of great range. We are indebted for our illustrations to The London Graphic.



A Naval 4·7-inch Lyddite Gun on Timber Platform.

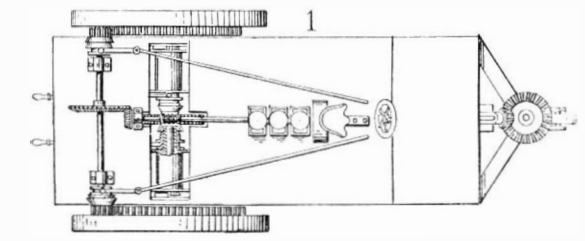


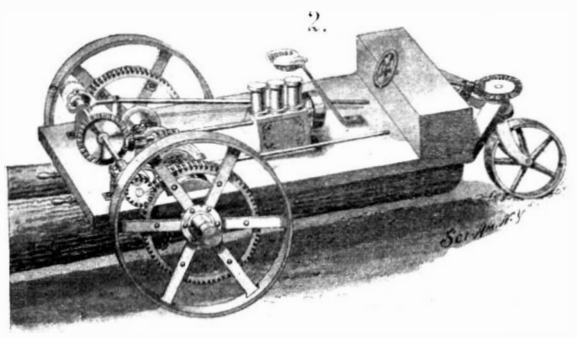
Naval 12-pounder on Improvised Carriage.

THE NAVAL GUNS AT LADYSMITH.

HAULING LOGS BY MOTOR TRUCKS.

That the automobile will some day find an extensive use in our agricultural and logging districts is not beyond the bounds of possibility. An auto-truck has been already invented by George F. Reed, of Waldo, Fla., which seems to possess the necessary strength and durability for the requirements of such heavy, mechanical traction. Mr. Reed's vehicle is driven by a gasoline engine, firmly secured on a platform or body





HAULING LOGS BY MOTOR TRUCKS.

supported by two rear traction wheels and a front pilot wheel. The engine shaft extends longitudinally, and carries at its rear end a bevel gear meshing with another bevel gear on a transverse shaft. Pinions on the end of the transverse shaft engage spur-gears forming part of the rear traction-wheels. Clutch-members on the transverse shaft and pinions can be thrown into frictional engagement with each other by means of two levers operated by the feet of the driver.

On the stationary axle of the rear wheels two drums are loosely carried, which, by means of friction-clutches, can be independently thrown into gear with a worm-wheel driven by a worm on the engine-shaft. The clutches are connected with levers extending below the platform, and are thrown by an assistant standing at the side of the truck, since they are not manipulated while the truck is in motion. About the drums, chains are wound, by means of which the logs are drawn up beneath the platform and supported during transportation.

The vehicle is steered by means of the front pilot-wheel, the controlling-shaft of which passes diagonally through the gasoline supply tank and carries a hand-wheel within reach of the driver's hand.

German Steamship Lines at Hamburg.

The following figures show the great development of the commerce and the navy of the German empire, and particularly the expansion and present importance of the port of Hamburg: At the beginning of this year, nine great navigation companies were counted at this port, among which may be mentioned the following: The most important is the Hamburg-American line, which has 67 steamers, giving a total tonnage of 256,300. The financial condition of this line is good, it having paid a dividend of 8 per cent upon its capital. The 30 steamers of the Hamburg-South American line represent 101,350 tons, and the dividend paid during 1898 reached 13 per cent. The Kosmos line has 25 steamers, with a tonnage of 90,000. Among the other companies may be mentioned the Sloman line, with 25 boats and a tonnage of 53,300; and the Woerman line, having 21 boats and a tonnage of 39,000; the 11 boats of the German-Australian line, amounting to 44,300 tons, gave a dividend of 10 per cent; the German-American Petroleum Company has 10 boats, tonnage 35,000. Following these are the German-Levant, with 14 boats, representing 29,000 tons, and the East African line, with 12 boats and a tonnage of 31,000.

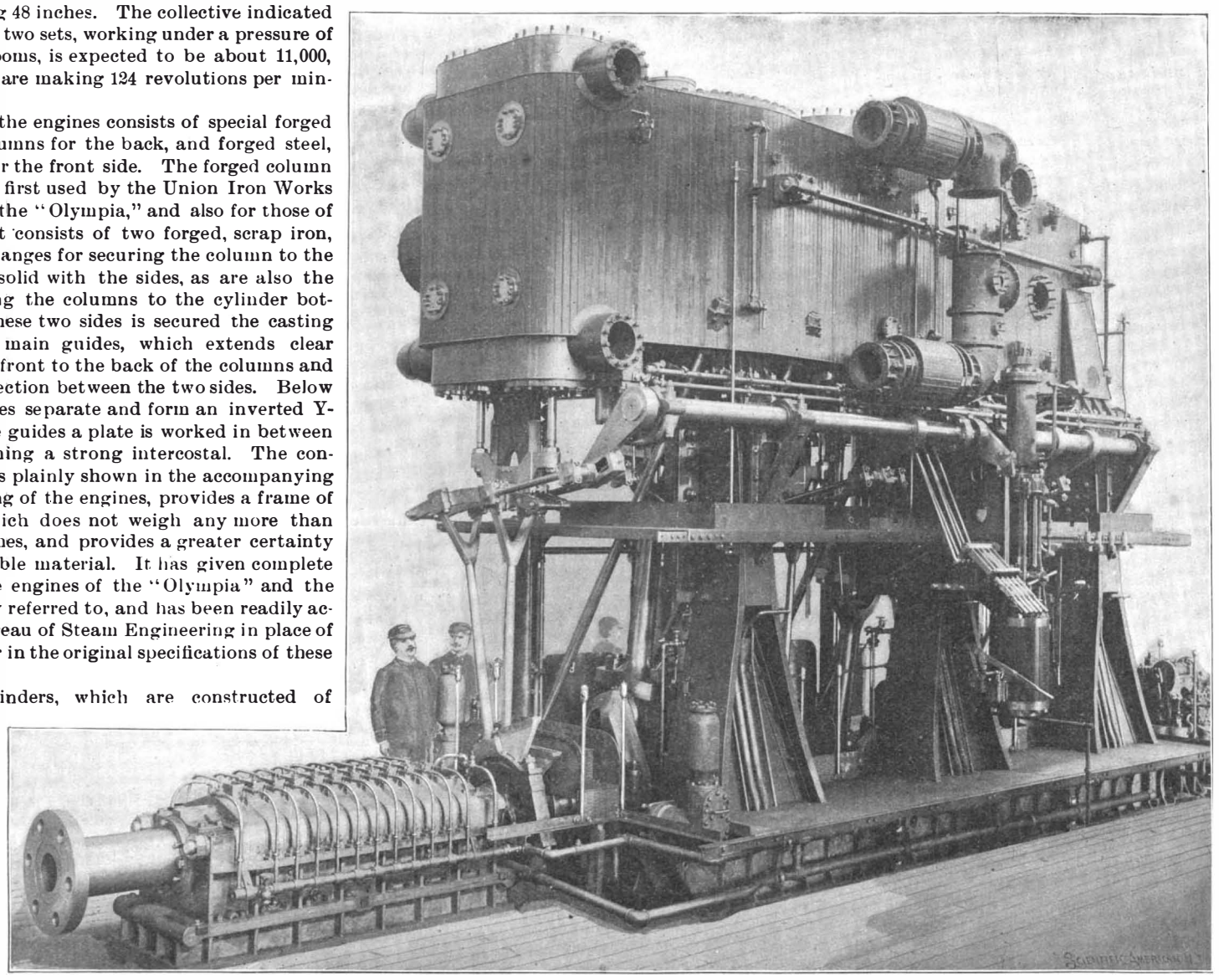
© 1899 SCIENTIFIC AMERICAN, INC.

THE ENGINES OF THE FIRST-CLASS BATTLESHIP "WISCONSIN."

The battleship "Wisconsin" is being constructed under an Act passed in 1896, authorizing the building of three seagoing battleships, which are known as the "Alabama" class. The "Alabama," which was illustrated in the SCIENTIFIC AMERICAN of September 30, is being constructed by the Cramps, of Philadelphia, the "Illinois" by the Newport News Shipbuilding Company, of Newport News, Va., and the "Wisconsin" is being built at the yards of the Union Iron Works, San Francisco, Cal. It was the last named firm that constructed the "Oregon," whose remarkable trip of 14,000 miles around Cape Horn will be fresh in the memory of our readers. By the courtesy of Mr. G. W. Dickie, superintendent of the Union Iron Works, we are enabled to present the accompanying illustrations of the engines of the "Wisconsin" as they appeared when set up in the erecting shops of the Union Iron Works prior to their being installed in the engine room of the "Wisconsin. There are two sets of these engines, rights and lefts, placed in separate water-tight compartments, separated by a longitudinal bulkhead. They are of the vertical, inverted-cylinder, direct-acting, triple-expansion type. The high pressure cylinder is 33½ inches, the intermediate 51 inches, the low pressure cylinder 78 inches in diameter, the common stroke of all pistons being 48 inches. The collective indicated horse power of the two sets, working under a pressure of 1 inch in the firerooms, is expected to be about 11,000, when the engines are making 124 revolutions per minute.

The framing of the engines consists of special forged and bolted-up columns for the back, and forged steel, turned columns for the front side. The forged column is similar to that first used by the Union Iron Works for the engines of the "Olympia," and also for those of the "Oregon." It consists of two forged, scrap iron, plate sides, with flanges for securing the column to the bed-plate forged solid with the sides, as are also the flanges for securing the columns to the cylinder bottoms. Between these two sides is secured the casting which forms the main guides, which extends clear through from the front to the back of the columns and forms a rigid connection between the two sides. Below the guides the sides separate and form an inverted Y-frame. Below the guides a plate is worked in between the two legs forming a strong intercostal. The construction, which is plainly shown in the accompanying half-tone engraving of the engines, provides a frame of great rigidity, which does not weigh any more than the cast steel frames, and provides a greater certainty of absolutely reliable material. It has given complete satisfaction in the engines of the "Olympia" and the "Oregon" already referred to, and has been readily accepted by the Bureau of Steam Engineering in place of the type called for in the original specifications of these engines.

All of the cylinders, which are constructed of the best quality of cast iron, are provided with working linings, and are steam jacketed. The main steam valves are of the piston type, and they are worked by Stevenson's double-bar links; practically all of the valve gears are made interchangeable.



ONE OF THE TWIN ENGINES OF THE BATTLESHIP "WISCONSIN."

The crank shaft is made in three sections, which are reversible and interchangeable. The crank pins are 14¾ inches in diameter and 17 inches long, and the crank webs are each 16¼ inches wide by 10 inches thick. A 7½-inch hole is bored axially through each shaft and crank pin. The thrust shafts are 14 inches in diameter with 9-inch axial holes. Each shaft has 11 thrust collars, 2 inches wide, placed 3½ inches apart, the outside diameter of the collars being 21½ inches. The propeller shafts are 14¾ inches in diameter, with a 9¾-inch axial hole bored throughout their length, the hole being tapered in the after section, where it passes through the propeller hub. All of the crank line and propeller shafting is of hollow, forged steel, of very high quality.

The reversing gear is of the straight-push type, controlled by a hydraulic controlling cylinder and differential valve gear, and a hand pump is attached to the hydraulic end of the reversing engines for operating by hand. The air pumps, which are of the single-acting vertical type, with inverted steam cylinders, are independent of the main engines. There are two air pumps for the set, which balance each other.

A special feature of the condensers for these engines is the fact that the shells are to be made of steel plate, the water ends being of bronze. This is a feature that may be considered as somewhat experimental, and the result of using steel for the shell will be watched by marine engineers with considerable interest. The main circulating pumps which supply the condensers with cooling water are of the centrifugal type. There are two of them, one being placed in each engine room. When they are used as emergency pumps on the bilge of the ship, they will have a capacity of 12,000 gallons per minute each. Each engine room is also to be fitted with an auxiliary condenser with its air and circulating pumps, fire and bilge pumps, main and auxiliary feed pumps, and hydraulic steering pumps in duplicate.

The screw propellers are of manganese bronze and are three-bladed, the pitch being variable from 16 feet 6 inches to 18 feet 6 inches, the designed pitch being 17 feet 6 inches. The diameter of the propellers is 15 feet 6 inches. The starboard propeller will be right, and the port propeller left-handed. Each blade is firmly bolted to the boss by tap bolts of rolled manganese or Tobin bronze, secured by lock plates. An interesting feature is that the hubs and plates for these propellers have been tinned, this being done for the purpose of maintaining a better surface on the propellers, and also with a view to mitigating, to a certain extent, any galvanic action which may arise between the propellers and the adjacent steel structural material.

The ship carries eight single-ended steel boilers placed in four compartments, two boilers in each compartment. Each boiler has a mean outside diameter of 15 feet 6½ inches, and an outside length of 10 feet. They have a total grate surface of 685 square feet and a total heating surface of 21,200 square feet; the boiler pressure is 180 pounds to the square inch. Each boiler is provided with four Morrison suspension furnaces of 3 feet 3 inches internal diameter. The thickness of the shells is $1\frac{7}{16}$ inches.

We close our description of the engines with a brief statement of the leading particulars of the "Wisconsin." When this fine ship is equipped with all her guns and is carrying two-thirds of her ammunition and two-thirds of her stores, she will displace 11,525 tons. Her estimated trial speed is 16 knots, although she will probably make about 17 knots. She carries a normal coal supply of 800 tons, but with close stowage her bunkers will accommodate 1,200 tons. She is protected by a water-line belt of 16½ inches thick at the top and tapering to 9½ inches at the bottom. It will also taper toward the ends, being 4 inches thick at the bow. The turrets and barbettes will carry 14 and 15-inch armor. The armament will consist of four 13-inch breech-loading rifles, fourteen 6-inch rapid-fire guns, sixteen 6-pounders, and ten smaller guns. There will be four torpedo tubes. An excellent feature of the "Wisconsin" will be her lofty spar deck, which will raise the freeboard to about 20 feet as against 13 feet in the "Oregon."

A Proposed School for Consuls.

After several long-continued sessions, in which many important papers were read and discussions were had, the special committee appointed by the National Educational Association to inquire into the practicability and advisability of the long talked of National University, at Washington, has adjourned until next February, leaving an unfavorable report in the hands of its secretary. While final action has been deferred, the report, which is in the form of a set of five resolutions, is of such a nature as to clearly show that the committee regard such an undertaking as not within the pale of the government's proper sphere. Coming from such men, among others, as President Eliot, of Harvard, President Schurman, of Cornell, President Harper, of Chicago, President Draper, of Illinois, Prof. Butler, of Columbia, and Superintendent Maxwell, of New York city, this report must carry much weight and is likely to put an effectual damper on the plan for some years to come, at least.

One recommendation of the committee, however, is of special and timely value and must commend itself to every thinking citizen who has had any acquaintance with foreign trade or travel. It is contained in their fifth resolution and reads as follows:

"Fifth—The government, through the State Department, might wisely maintain in Washington a school for consuls, analogous to West Point and Annapolis, and like those schools, leading to a life career in the government service."

If nothing other than this is ever accomplished by this committee, and it can, through its influential membership, get practical politics to recognize that aptitude, special training, and permanency are the three essential keynotes to the upbuilding of a really invincible consular force, placing us in foreign trade where the training at Annapolis has placed us in naval affairs, their labors will have been amply productive and beneficial. It may be added that such a school for training for life as a representative of this country in foreign lands is likely to be even more valuable in furnishing an efficient staff for colonial administration; a civil staff which must soon assume very considerable proportions in our administrative life.

The New Cars of the Third Avenue Line.

The new cars on the Third Avenue line are said to be the largest in use on any street railway in the United States. They are 41 feet long and the body of the car is 32 feet long. The platforms are unusually commodious, and the doors are of extra width. The seats are the same design as the steam railroad coach seat and there are twelve of them on each side. Each seat accommodates two persons, but they are a trifle narrow. The windows are arranged so that they can be dropped down, converting the car into a kind of open car. Each car is provided with air brakes, which can stop a car under full headway in half its length. Four sets of cylinders and brake mechanism, one for each pair of wheels, are furnished, so that the breaking down of one would not impair the efficiency of the system. Ordinary air-brakes are also provided. The weight of the new cars is 40,000 pounds and they are driven by four 30 horse power motors.

GELOSE is a gelatine obtained from agar-agar and is used for preparing culture fluids for bacteria.

© 1899 SCIENTIFIC AMERICAN, INC.

Correspondence.

The Explosion at the Dominion Carbide Works, Ottawa.

To the Editor of the Scientific American:

The Scientific American recently published a short editorial on the accident at the Dominion Carbide Works. The coroner's inquest held at the request of the City Council brought out the following facts:

The fire originated in a building adjoining the carbide works, cause unknown.

A hole was cut in the roof of the works directly over a crucible containing about 1,000 pounds of molten carbide.

Water from the firemen's hose was poured in through the hole on the upper floor, whence it streamed down into the furnace room on pigs of carbide lying on the floor, and on a small quantity of broken carbide ready for packing. Gas generated from the water dripping on the cold carbide. It was ignited by burning wood falling through the ventilating shaft, and burned quietly as rapidly as it was given off. Suddenly an accumulation of water poured into the crucible on top of the molten carbide. An explosion followed that wrecked the plant and injured eighteen men. The verdict of the jury was that the explosion came from that crucible, but left it an open question as to whether it was caused by the rapid conversion of the water into steam or by water gas formed by the vaporization of the water on the unfused mixture of coke and lime. The expert testimony was all against the possibility of the explosion being acetylene. Such men as Thomas Macfarlane, analyst for the Department of Inland Revenue; Prof. Shutt, analytical chemist, Dominion Experimental Farm; Prof. McGill, of the Geological Survey, and the men engaged in manufacturing carbide, deposed that it was impossible to generate acetylene from red hot carbide. Medical evidence as to the injuries from the explosion showed that they were the result of dry heat, not steam. The victims themselves said that the burns came from the hot unfused mixture of lime and coke. Only one injury was serious, resulting in the loss of an eye.

The coroner's verdict has dissipated a great deal of prejudice against carbide. The jury came to the conclusion that its manufacture was not of a hazardous character when conducted in a fireproof building. The City Council, acting on the finding of the jury, have instructed the by-laws committee to frame a by-law to regulate the manufacture and storage of carbide. They consider this necessary because Ottawa is destined to be the center of an immense carbide industry. Within the city and in a radius of 45 miles, there is over a million horse power in waterfalls, abundance of lime, and easy access to coke and charcoal. In this northern country, where the nights are so long in the fall and winter, acetylene is bound to take a front rank as the poor man's light. A. Holland.

Ottawa, Canada.

Fossil Hunting in the Rockies.

By Louis E. Van Norman.

The State of Wyoming is a geological wonderland. It is new land, the newest land on the continent, geologically speaking. In the prehistoric ages, but nearer to the time of the advent of man than that at which any other American land appeared, if not after this advent, this part of the United States arose out of the primeval waters. Up to this time there had been an inland sea, or several seas, over all Western North America from the Gulf of Mexico clear upward to the Arctic Ocean. The outlines of this primeval sea can be traced almost all over the great plains through the Dakotas, Montana, Wyoming, Colorado, Arizona and New Mexico, by the fossil remains which are scattered throughout this vast area in great profusion. The long ages subsequent to this uprising of the land, the Mesozoic time of the geologist, have also left rich deposits to mark them, from the little invertebrate ammonites to the giant vertebrate dinosaurs of the Jurassic age, the largest land animals that ever lived. The natural surface formations all through this vast region are magnificent from a scenic point of view and marvelous from any standpoint. The Bad Lands, or lava fields of Dakota, the geysers, boiling springs and vividly colored rock formations of the Yellowstone National Park, the tremendous cañons through which the great rivers have cut their way to the ocean, the alkali lakes and deserts and the rich mineral wealth so comparatively near the surface—all these attest the youth of the earth's crust at this point and indicate some of the marvelous transformations which are being ceaselessly carried on in Nature's vast laboratory.

Small wonder, then, that this region is the paradise of the geologist. A number of scientific expeditions have explored these plains—notably the early ones of Dr. F. V. Hayden, from 1854 to 1859, and those of Prof. Marsh in the early seventies. The latter made more than 20 trips across the mountains and discovered 200 new species of animals. But the fossil field of Wyoming seems to be practically inexhaustible. For the past two or three years Prof. Reed, of the University of Wyoming, has been prospecting throughout the State, and last year he made several highly important discoveries. About ninety miles northwest of Laramie he came upon the bones of the most colossal animal ever taken from the earth's strata. This was a huge dinosaur, a monstrous lizard, measuring over 120 feet in length, the petrified skeleton alone, it is estimated, weighing more than 40,000 pounds. The labor of removing this giant is so enormous that the skeleton is still in its natural resting-place, but it is calculated by the university authorities that, by next spring, they will be entirely excavated.

What is, without doubt, the most thoroughly organized scientific expedition which has ever entered our great western domain has just finished its field labors. Led by Prof. W. C. Knight, of the University of Wyoming, 80 scientists, mostly professors of geology from the great universities and colleges all over the country, and their assistants, have spent "40 days in the wilderness"—exploring, examining fossil exposures and gathering specimens.

The expedition was thoroughly organized and equipped. Seventeen teams, with tents, paraphernalia and provisions, with seven cooks and a dozen cameras, left Laramie, the seat of the State University, on July 20. Three secretaries, Prof. Collier Cobb, of the University of North Carolina; Prof. E. H. Barbour, of the University of Nebraska, and the writer, kept a systematized account of what was being done, and gave information to the press of the more important finds. Everything possible was done to secure excellent and permanent record of the results of the trip. For the photographers a dark room, or, more properly, a dark tent, was provided, and every new move and scene was recorded on a dozen plates. The route lay through Southern and Western Wyoming, with the Grand Cañon of the Platte River as the chief objective from a scenic point of view.

The progress of the party had been systematically planned beforehand, to take place so that the fossils might be found in order, from the lower to the higher, from lowest invertebrate to highest vertebrate. Ammonites, baculites, belemnites—but there is no use going over the list of scientific names. Many beautiful and almost perfect specimens of these mollusks were found and shipped back to the various universities whose representatives were with the party. A number of slabs of carboniferous sandstone were obtained with ripple marks and very beautiful impressions of leaves on them, some of the latter as exquisitely limned as though carved with an engraver's tool or cut by the photographer's lens. Of course, however, the great objective of the trip was the vertebrate remains, found first at Lake Como, Aurora, in the massive ledges of sandstone which rise in successive tiers at this point. The landscape seemed familiar to us as we camped at the foot of the ridge one hot, dusty evening about five o'clock. Then we remembered. Prof. Marsh took out his great dinosaur (now in restoration at Yale) from this exposure and afterward painted the surroundings. The dinosaur was a mighty lizard, whose remains are found plentifully scattered throughout the Cretaceous and Jurassic inland seas of Wyoming. It was probably a land animal, though possibly it lived amphibiously on land and in fresh water swamps, and perhaps even along the shores of the salt oceans. Prof. Reed, in speaking of the monster discovered by him last year, said:

"An accurate idea of a living dinosaur is practically out of the question. According to my opinion, I should say that the animal now being brought to light weighed in life about sixty tons, that he had a neck thirty feet in length, and a tail perhaps sixty-five feet in length. His ribs were about nine feet in length, and the cavity of his body with the lungs and entrails out would have made a hall thirty-four feet in length, sixteen feet in width, and arched over probably twelve feet in hight. Such a space, if properly arranged, would seat at least forty people. A round steak taken from the ham of the animal would have been at least twelve feet in diameter, or more than thirty-five feet in circumference, and would have had a solid bone in the middle twelve by fourteen inches, with no hollow for marrow. A set of fours in cavalry could easily have ridden abreast between his front and hind legs, provided he had not objected. Every time he put his foot down, it covered more than a square yard of ground and must have fairly shaken the earth. The smallness of the head of this animal is a peculiar thing. I should say that the head of this mighty dinosaur was probably not larger than a ten-gallon keg. He must have been a very sluggish creature, as his brain cavity would certainly not warrant the belief that that organ weighed to exceed four or five pounds."

Remains of a number of other animals, mostly reptilian in their nature—with a few primitive mammals and birds—are to be found in great profusion in these Mesozoic beds of the West. It is believed by scientists that these animals inhabited the ancient lakes and swamps by myriads, and, in dying, sank in the mud. Their bones were covered over with other deposits and became petrified. All through the long geological ages they lay sinking deeper and deeper, until covered with perhaps 20,000 to 30,000 feet of solid rock. Then, in the titanic process of the birth of the Rocky Mountains, the great surface beds were tilted and twisted and bent upward, and, by erosion, the bones are brought to light. Owing to its massiveness and hardness, the bone most frequently found in the case of almost all fossil animals is the femur, although ribs, skulls and vertebræ are also plentiful. The second day of the camp at Aurora the expedition came upon its first dinosaur bones. Mr. Edquist and his assistants, of Gustavus Adolphus College, Minnesota, discovered a great femur, six and a half feet long, which they were able, by arduous and protracted labor, to excavate without much damage. A number of others—bones of all descriptions—were obtained on the expedition, the full value of which cannot be accurately estimated until the scientists return to the laboratories and begin the work of restoration. Quite an interesting and valuable collection of mineral specimens was also secured. There was a taxidermist with the party, and he can show a fine set of specimens of the bird life encountered on the trip. Mr. J. E. Cameron, of Coe College, Iowa, acted as botanist to the expedition, and went home laden with a collection of the rare and beautiful flowers which strew the prairies and deck the mountain sides.

As a camping trip what a splendid, delightful success it was! The fine, tonic air, the magnificent scenery, all the charms of outdoor life, in the finest game and fish country in the world, made the day pass hilariously and full of enjoyment.

In closing, I cannot resist the temptation to relate a little incident. As this is "on" the narrator as well as others I presume he will be pardoned for the telling. Let me preface the story by saying that up to the time of the occurrence I refer to, our acquaintance with coyotes, those small wolves of the Western plains, had been confined to hearing them howl most dismally and blood-curdlingly at about four o'clock in the morning—not so very far from the tent. The day I speak of, three of the party—a man from California, a man from Minnesota and the writer, who hails from the "effete East"—were exploring an old unused coal mine, indeed only a hole in the ground where the railroad had been prospecting for coal. The California man had a Springfield rifle and a belt fairly bristling with cartridges, the man from Minnesota was equipped with a double-barreled shot-gun and the other fellow had a six-shooter in his hip pocket. As we crept along the low gallery—so low in places that we were almost forced to go on all fours—suddenly there was a terrible howl which echoed throughout the narrow spaces till it sounded like a whole legion of demons--and something white and furry, with gleaming eyes and red jaws, dashed by us out toward the entrance to the mine. The mighty hunters, guns, revolvers, and all, tumbled over one another in headlong rout. The revolver went off promptly, with the result of causing the armor plating—pardon, the stiff corduroy trousers—of the deponent to be bent outward like the armor on the ill-fated "Maine." Upon our hurried exit we spied a very small coyote, probably much more frightened than we, scudding off over the plain. Then we redeemed our sportsmanship. Three firearms rang out simultaneously—though what was accomplished by the shotgun and the revolver it is hard to determine—and Mr. Coyote went to join the great company of former citizens of earth whose bleached skeletons whiten the trail from Wyoming to Utah.—The Independent.

Free Seed Distribution.

As most of our readers are aware, $130,000 is appropriated annually for free seed distribution, and this has occasioned much adverse criticism. Secretary Wilson is now preparing the part of his report which treats of free seed distribution. As far as possible, he wishes to avoid the hostility of the seedsmen by distributing entirely new varieties, which was originally contemplated in the appropriation, and distribute the varieties of seed which the commercial seedsmen are not handling and experimental seeds which have not gained a foothold. The Department's agents are engaged in a search for such varieties all over the world, and after carefully testing the seeds they will be distributed in the appropriate sections of the country. After the species has gained a foothold, the seedsmen may be trusted to take care of the current demand. Secretary Wilson is of the opinion that there is ample work for the Department without distributing time-tried seeds, and that there is enough room in improved grasses alone to absorb to advantage the entire appropriation that the government allows for the seeds. The introduction of one new variety of rice in the South which is now growing successfully is said to have a commercial value of $1,000,000 a year to the American growers; it cost the government only about $5,000. In connection with the rice cultivation it is interesting to note that investigations are being carried on relative to cultivating rice in an artificial swamp, which may be drained off when harvesting time arrives, so as to permit the use of labor-saving machinery. This will enable vast prairies to be utilized.

© 1899 SCIENTIFIC AMERICAN, INC.

Science Notes.

A correspondent informs us that in 1890 twenty ostrich eggs were hatched by incubator and eighteen of the birds were raised.

Congress will be asked for the establishment of a national park in the southern Alleghanies, probably in the Blue Ridge or Smoky Mountains, west of North Carolina.

A telegram has been received at the Harvard College Observatory from Prof. Kreutz, of Kiel University, stating that a planet of the tenth magnitude was discovered on December 4, by Charlios.

The stain of banana juice is almost indelible. It does not proceed from the stalk or plant, but exists in the green fruit as well, from which when cut or bruised it exudes in the shape of viscid milk or cream-like drops.

The International Commercial Congress at Philadelphia was an entire success, and the city of Philadelphia spent $100.000 in entertaining the guests. It is said that large orders were placed by foreign delegates for American goods.

In 1890 there were only four insurance companies in Japan, with a capital of 1,600,000 yen. In 1898 there were seventy-three registered companies with a capital of 34,720,000 yen. At the same period the thirty-six Japanese companies alone showed an issue of 510,000 policies, the value of 120,000,000 yen.

The President of the New York Board of Health has taken action toward the strict enforcement of the law regarding the sale of poisons. There have been many cases of suicide lately by carbolic acid poisoning, and if this chemical was more difficult to obtain, it would doubtless decrease the number of cases.

The climate of Egypt is magnificent, and there are few winter resorts that are preferable, meteorologically speaking. The air is fine and dry and the sunshine is perfect, while with equable temperature, wholesome food and water, and gentle breezes, there is little to be desired. Unfortunately, the sanitary arrangements in Egypt are very bad, and most of the hotels, even in Cairo, are built on contaminated sites.

Fruit is now being shipped from New South Wales packed in the bark of the ti tree and the outer bark of the Melaleuca leucadendron, which is shredded into a sort of coarse chaff. These barks seem to have some peculiar power of preserving oranges during carriage. This may be owing to the elasticity of the packing and the fact that it permits of ventilation. Unless the bark is cut too fine there is no sweating possible. The bark costs only $20 per ton.

The work of the Egyptian Exploration Fund for the year has lain in the same district as before, a short distance down the Nile from Dendereh. Altogether about 1,250 graves of prehistoric age and about as many historic graves—mainly about the twelfth dynasty—were opened and recorded. The society has already received from the Egyptian government the promise of a permission to work at Abydos, one of the most important sites in Egypt. Prof. Maspero will return to Egypt to resume the direction of the Department of Antiquities.

In 1897 in Germany 1,383,700,000 gallons of beer were consumed , 1,192,000.000 were drunk in Great Britain ; 180,000,000 in France, and 90,000,000 in Russia. It is estimated that 36 gallons per head are drunk in Belgium, 32 in Great Britain, 25 in Germany, 21 in Denmark, 12 in Switzerland, 10 in United States, 9 in Holland, 5 in France, 3½ in Norway, 2½ in Sweden, and 1 in Russia. A writer in The North American Review declares that a large quantity of beer is consumed in order to satisfy the craving for the elements which are eliminated from wheat in making white bread.

According to Technische Notizen, the celebrated Parisian oculist Dr. Emil Berger has constructed a binocular microscope which admits of seeing objects plastically (i. e., in relief). As is well known, the stereoscopic effect is lost by the use of only one eye, and consequently of our monocular microscope, not to speak of the harmful suppression of the vision on one eye at the expense of the other. This new microscope places the object in a normal distance (about 33 centimeters) from the eye. If the news is credible, Dr. Berger's invention will prove a great boon to the hundreds of thousands whose profession forces them to use a microscope.

The current number of the SUPPLEMENT contains a most interesting account of the manner in which photographs are obtained in Paris in the theaters by M. Boyer. In brief, the system consists of an arrangement for burning several magnesium cartridges in succession. A number of batteries of burners are used, and pure magnesium is consumed. The powerful blowing apparatus permits a prolonging of the flash for the time required. The cartridge apparatus is actuated by electricity. In order that it may be possible for the operator to make a series of negatives without being annoyed by the smoke of the preceding flashes, there is installed a ventilating fan actuated by an electric motor. By means of a cloth sleeve the smoke and dust are carried outside of the building.

Engineering Notes.

The Cooke Locomotive and Machine Company, at Paterson, N. J., has just built five locomotives for the Barry Railway Company, of Wales.

The Boers do not seem to have learned how to render the rails of railways unserviceable. They heat them and then bend them around trees or other objects. They can, however, be easily straightened.

Ninety new locomotives have been ordered by the New York Central Railroad, and five of them will be built after the design invented by Cornelius Vanderbilt and tested by him on the Mohawk division of the road for nearly three months.

Between January 13, 1898, and August 13, 1899, new lines of railway, with a total length of 3,171 miles, were thrown open for traffic in European and Asiatic Russia. The total length of railways in the whole Russian empire, on August 13, was 30,321 miles.

Twenty railways threw open their shops to sixty Cornell students during their last vacation. Their employers now say they were cheap at the $1.30 a day they were given, and the boys say what they learned was cheap at the price of a three months' vacation.

Rear-Admiral Rogers, President of the Naval Inspection Board, has returned to Washington from a visit with the Board to Peconic Bay where a test was made of the submarine torpedo boat "Holland." The Rear-Admiral made a verbal report, speaking in the most favorable terms of the boat.

The first railway in Corea was opened to traffic on September 18. It runs between Seoul and Chemulpo, and the track is now laid to within 5 miles of Seoul. It was built by the American Trading Company, is of standard gage, and is 26¼ miles long. The Japanese government appropriated $900,000 for its completion. American materials and cars are used throughout, and there are two trains in each direction a day.

What is believed to be the largest shearlegs in Great Britain have recently been completed by a shipbuilding company. They are guaranteed to lift 150 tons. The legs have an overhang of 60 feet and an inhang of 13 feet from the center of the trunnions. The front legs are 45 feet apart at the bottom, measured from center to center, and are long enough to describe a radius of 135 feet. The back leg is 185 feet long.

Each car of the armored trains which are now being employed in British operations against the Boers is painted khaki color. Both the engineer and the firemen are completely protected, and the orders are conveyed by bell signals. One of the engines is fitted with a steam pump. Hose is provided of sufficient length to enable water to be taken in from rivers or other sources of supply on the journey. The engine is placed in the middle of the train to allow for the use of Maxim and other guns.

It is stated that the application of heat accumulators on the locomotives of the Moscow-Koursk line of the Russian state railroads has given excellent results, allowing an increase of weight of trains of from 15 per cent to 25 per cent. The apparatus, according to The Engineer, consists of a cylindrical reservoir of cast iron with a capacity of about 300 gallons placed horizontally on the top of the boiler and communicating with it by pipes and valves. During stops or in running down grades, when little or no steam is consumed, it is used to heat the water in this reservoir, which is then used for the feed.

Engine No. 601 of the Lake Shore and Michigan Southern Railway made a remarkable run between Buffalo and Cleveland, November 22. It hauled a fast passenger train with eight cars. It left Buffalo 59 minutes late and ran into Cleveland 2 minutes ahead of time, thus making up one minute more than an hour in a distance of about 185 miles, the schedule time being 4 hours and 25 minutes. Between Perry and Painesville, a distance of 5 miles, the running time was made in 3 minutes. The engineer in charge of the train was of the opinion that even this speed could have been increased.

A German manufacturer, who recently visited Pittsburg, was greatly surprised in the difference in the welcome he received eight years ago and at the present time. At the former period the manufacturers entertained the foreign visitors lavishly and showed them all the wonders of natural gas and the resources of their plants. All this is now changed. He requested permission to inspect certain mills and see the improved machinery and methods in vogue. He was surprised to find that it was impossible to obtain the required permit. Other foreigners have succeeded in entering some of the mills, but the manufacturers are becoming more and more chary in granting facilities for the inspection of their plants. There was a time, and it was not so long ago, when foreigners did not care to enter the mills; but at the present time they are very anxious to do so. It should be remembered that abroad in very few cases are foreigners ever allowed to inspect plants, and there is no reason why we should grant favors which we cannot receive in return.

Electrical Notes.

The Electric Review objects to the term "wireless telegraphy," and the other names which have been proposed seem equally objectionable, such as "wave telegraphy," "etheric telegraphy" and "space telegraphy."

A prominent detective agency has recently investigated the use of electricity for breaking the vaults of banks and safes. The report states that there has never been a single successful burglary of a bank vault or safe by electricity, and that there is no necessity for alarm on this score.

According to Engineering, a young Danish inventor has constructed a phonograph which will take telephone messages. It is said that a steel band is used instead of a wax cylinder. If true, this would be a most interesting and important invention, but we cannot vouch for its authenticity.

Wireless telegraphy will, it is said, be introduced into the British navy as a branch study. The "Hector," an old hulk lying off Portsmouth, has been fitted out as a school of instruction, and will be used as a receiving station, and the "Canopus" will be provided with a regular equipment of Marconi apparatus.

A curious novelty is a clock let into the sidewalk. The dial consists of a glass plate through which are seen large numbers denoting the hour and minutes. The upper line changes every hour, and the lower every minute. The figures are operated by electricity and are controlled by a master-clock inside the store. The numbers are carried on celluloid ribbons, which are fed by proper mechanism.

There was a test of the Pollak-Virag system of rapid telegraphy from Chicago to Milwaukee on November 22, and a test was also made on the same day on a line from Chicago to Buffalo and return. Messages were sent at the rate of 122,000 words an hour between the first named places, and 90,000 words an hour from Chicago to Buffalo and return. The results were not as satisfactory as was hoped, owing to the fact that all the apparatus could not be gotten into position.

A new dredge for use on the Volga River, in Russia, has just been built by the Cockerill Company, of Belgium, and is constructed in two parts so as to pass through the canal system leading from the Baltic. Each half is 216 feet long, 31½ feet wide and 9 feet deep, and each half can be operated separately making a bottom cut 62 feet wide. The dredge has steel hulls and is propelled and controlled by electrical machinery of American manufacture. Steam is generated by American boilers fired with naphtha.

A New York doctor has sent a letter to the Park Board proposing a system of signals in the park, which will do away with much of the uncertainty regarding runaways. He suggested that at the reservoirs there be stationed alarm bells, which will ring under certain conditions and that they be electrically equipped and connected with various stations along the different roads. At each station will be detailed a saddle horse and rider probably from the Police Department, and as soon as the bell rings the horse will be released, somewhat similar to the system in vogue in the Fire Department. Those in carriages and horseback riders will then be warned by the ringing of bells at the different stations, so that they can get out of the way of danger.

The Electrical World notes that in modern electrical development there is a general disappearance of the original form of the Kelvin mirror galvanometer. The instrument was simple, sensitive and useful, and before the dynamo came into existence this type of instrument was used in nearly all electrical measurements. When dynamos spread and multiplied, the convenience of this galvanometer for measuring purposes waned and direct-reading instruments were introduced. The worst trouble with mirror galvanometers was due to stray magnetism. The same is true of the tangent galvanometer. In the days of the early dynamo they were largely used. The D'Arsonval type of mirror galvanometer came to the rescue at this juncture, and now largely occupies the place of its predecessor. This instrument usually ignores magnetic changes in its neighborhood.

Stockholders of the Electrolytic Marine Salts Company, to which we have already referred on a number of occasions, are coming out of their speculation rather better than might have been expected. The final 6 per cent was paid in liquidation on December 4, making in all 36 per cent of the amount paid in on the stock. This result has been secured, according to Engineering and Mining Journal, by the sale of the dock and shore property in Maine, and by the surrender by the founder of the company, who was the inventor and promoter of the swindle, of a small part of his profits, and in return for this he retains a liberal balance and is left to pursue the studies of life in Paris which he undertook when he left the company and the country, free from annoying legal inquisitions. The company's plant at Lubec, Maine, is earning money for the parties who bought it. It is not, however, turning out gold bricks, but canned sardines.

© 1899 SCIENTIFIC AMERICAN, INC.

THE TROJAN HORSE AT THE PARIS OPERA HOUSE.

The Opera House, of Paris, has just put upon the stage a work of Berlioz, one part of which, under the name of "The Trojans," was played a short time ago at the Opera-Comique, although there was nothing comical about it, but rather the contrary. The other part, which the Opera House is now giving, is called "The Taking of Troy." Now, every one knows that in this affair a wooden horse plays an important rôle. It is probable that Homer and Virgil and the other authors who have written upon this subject refer to a more or less well founded tradition of a deed of war that made some stir in its time; but it seems scarcely credible that the Greeks would have been imprudent enough to inclose their bravest warriors in a frame having somewhat the appearance of a horse, or, on another hand, that the Trojans could have been simple enough to haul this affair into their city without perceiving that it was inhabited. Moreover, in view of the means that they had at their disposal, it would have taken them a long time to transport such a mass, even had they desired to do so. But, no matter; poets and musicians do not bother themselves with such details, and so we, in order to follow them, are obliged to reconstruct (for them alone, fortunately) the famous horse of Troy. It was M. Vallenot, the skillful head machinist of the Opera, to whom the business was intrusted.

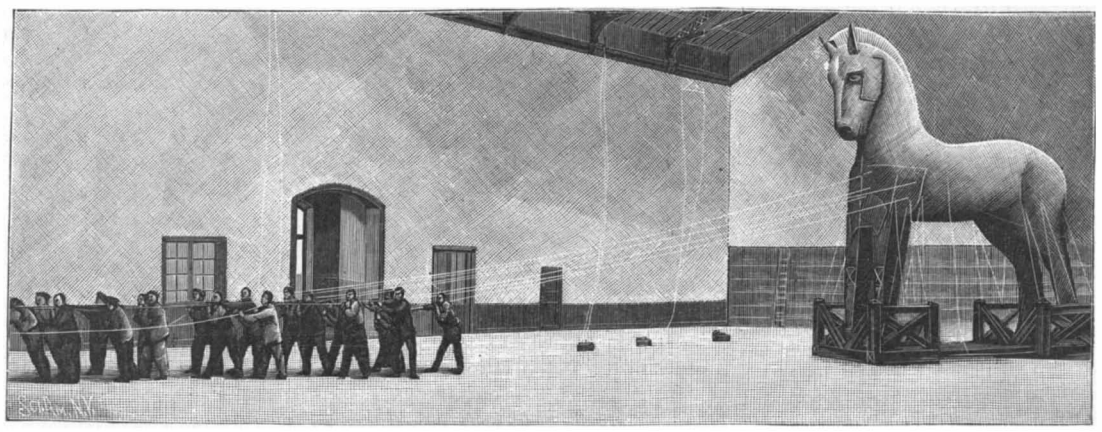


Fig. 1.—WORKMEN DRAWING THE TROJAN HORSE IN SHOP OF THE OPERA HOUSE.

Documents do not abound, since there are nothing but vague bas-reliefs that can be connected with this monument, and all that we can do is to refer to the Iliad and Æneid. Here we find, among other things, that the legs of the Trojan horse were formed of four trunks of young oaks, and that the body and head were of red fir. In order that the Opera horse may conform to this description, tints have been applied to it that imitate those of the woods employed in the original. The whole is very satisfactory, and it may well be conceded that it resembles the machine of war that the Greeks constructed in order to occupy their moments of leisure during the long years of the siege.

The Opera horse is about 28 feet in height (Fig. 2). It is made entirely of fir and rests upon a base 26·25 feet in length by 8·2 in width, surrounded by a fence. The whole weighs 9,240 pounds. The legs form the base of a huge framework constituting the animal's body, and it is to this framework that are applied the belly, flanks, hindquarters, shoulders and head, which latter is 11·5 feet in height and weighs 1,320 pounds. The nostrils, forehead, and eyes are sculptured, while the rest is constructed of juxtaposed pieces of board, and forms a sort of inlaid work which is very well executed.

As the Opera House does not give the same play every day, and as an accessory of such a size is somewhat cumbersome, it was necessary that it should be capable of being easily dismounted. To this effect, the head, neck, and back are provided with rings, through which, with the aid of ropes passing through pulleys above, the pieces are quickly let down to the floor. After this, the frame, which is assembled by bolts, is dismounted in less than an hour (Fig. 3).

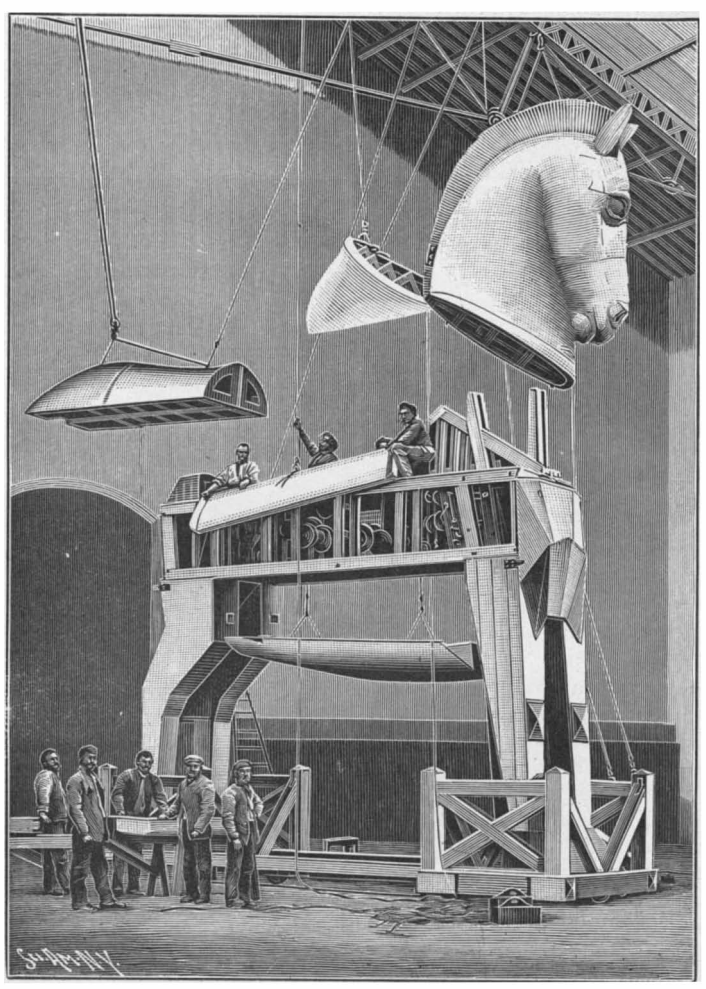


Fig. 3.—DISMOUNTING THE HORSE OF TROY.

However, when the plays produced during the week do not require a great display of stage setting, the horse is not dismounted, but merely stowed away. By means of two cables winding around a winch in the loft, the mass of 9,240 pounds is raised about two inches, and then, while some of the machinists quickly remove the inclined plane upon which it rests, others cause it to turn about 90 degrees. Then, at a signal, it is gently lowered upon another track provided with rails and at right angles with the first, and is pushed to the back of the stage, where it is no longer in the way.

The horse is not inhabitable, since the piece does not require the entrance and exit of Greek warriors before the audience; but it has to pass over the entire width of the stage—starting from the wings to left of the spectators and going to the right in order to enter the breach made in the walls of the city. This gives rise to a large procession, formed in part of Trojans, who drag the animal (Fig. 1). Now it would never have been possible, no matter how wide the stage, to make parade of this entire "team," and so it became necessary to employ an artifice. The ropes upon which the men who cross the stage pull are really attached to the horse, which is supposed to be still very far away, while in reality it was very near by and concealed by the side scenes. But the ropes are all of the same length because they are wound around drums that are installed in the framework (Fig. 3) and provided with brakes so that the ropes shall be very taut in order to make it appear that the Trojans are in fact drawing a heavy load. In reality, it is by a windlass placed under the stage that the machinists move the colossal animal at the proper moment. The base upon which the latter rests is, moreover, provided with rollers which run over rails fixed to the inclined plane representing the declivity to be ascended in order to reach the walls of the city. The effect of this huge mass crossing the stage is very imposing.

For the above particulars and the illustrations, we are indebted to La Nature.

The Evolution of the Bedroom and Bedstead.

Perhaps the last article which the late Lawson Tait contributed to medical literature was "Hygiene of the Bedroom and Bedstead," which appeared in several British and American journals. It treats of the evolution of the bedroom and of that now necessary article of furniture, the bedstead, in Great Britain. It tells us, says The Medical Record, that in the days of the cave dwellers and through the various stages of savagery and nomadic life, dwelling space was used for all purposes in common. It was not until the wandering hunter had, so to speak, settled down that he saw the advantage of putting aside a portion of his dwelling for sleeping purposes. The Briton in the time of the Norman era had a very fair notion of what constitutes a comfortable bedroom and bedstead, although his castle might be outwardly grim and forbidding. The walls of the castle were thick and solid, thus securing a fair uniformity of temperature, while the downdrafts of cold air were modified by hangings of tapestry. For their bedsteads there was no need of hangings. The Saxon farmer, however, had to live under very different conditions. His house was of wood, and carpentry at that time was at very low ebb, so that the doors and windows were ill-fitting, and drafts were the rule. This resulted in the evolution of that abomination of abominations, the four-poster bed; and as Dr. Tait preferred to put it, "A small apartment was constructed inside the bedroom in the shape of a four-poster hung round with curtains, into which a whole family must have crowded, possibly with the addition of occasional visitors." The conservative Britisher clung to his time-honored four-poster until the fifties, when occurred the dawn of domestic sanitation. The first step in the right direction was the introduction of the metallic bedstead.

American Inventions Abroad.

The fact that the United States is the most profitable field for the exploitation of useful inventions has taken a firm hold upon the inventive minds of other countries, says Consul Albion W. Tourgée, of Bordeaux, France. The first thing a man does who has a new idea of any sort is to seek to have it patented in the United States. This is specially true of inventions pertaining to railroad appliances. French inventions are usually defective in the mechanical character of the means by which the end sought to be accomplished is attained. This is, no doubt, due to the fact that so small a portion of the population have any practical mechanical knowledge. Almost every man in the United States knows the use of tools, and very many who have no manual occupation are fairly skilled workers, and those who have inventive genius are not ashamed to devote their leisure time to the acquirement of the technical skill necessary to prepare their working models and perfect their inventions. In France, on the contrary, such knowledge is considered derogatory to anyone in the higher walk of life. A clerk will not close a shutter nor dust off the top of the desk on which he works, since that is the business of an "ouvrier"; nor will a man who moves in good society permit himself to be seen carrying a package of any sort along the street. One result of this exclusive use of tools by laborers is that French inventions usually have to an American a certain sense of awkwardness in their mechanical application. The idea may be a good one, but there is very seldom any of the handiness which one finds in an American invention. Mr. Tourgée cites a French invention which was brought to him. It does not seem to us to be particularly new, and he says concerning it that whether the system is of practical importance or not, it serves to show how the United States is regarded by the inventors of Europe, who make haste to secure protection under our law, so as to take advantage of the wonderful market it opens to really meritorious devices.

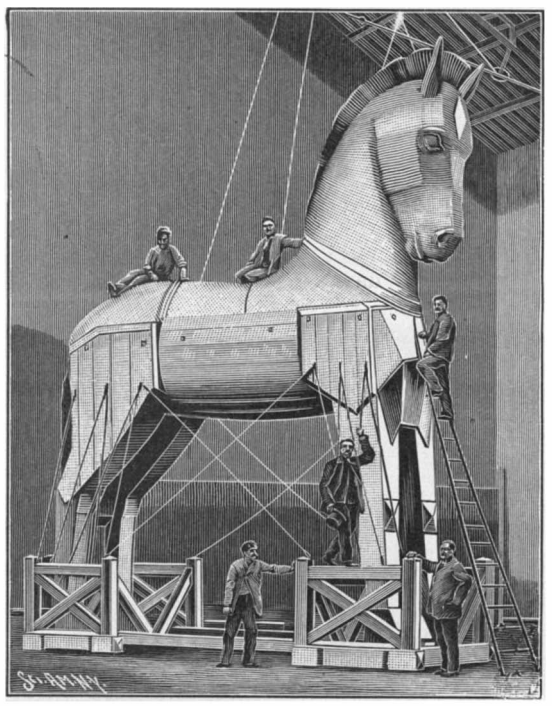


Fig. 2.—THE HORSE COMPLETE.

THERE is a total enrollment of about 3,000 students in Cornell University, consequently the class rooms, lecture rooms, and laboratories are overcrowded. This shows that Cornell is enjoying well-deserved prosperity. Extensive additions are contemplated. There are now 225,000 volumes and 36,000 pamphlets in the library of the university.

© 1899 SCIENTIFIC AMERICAN, INC.

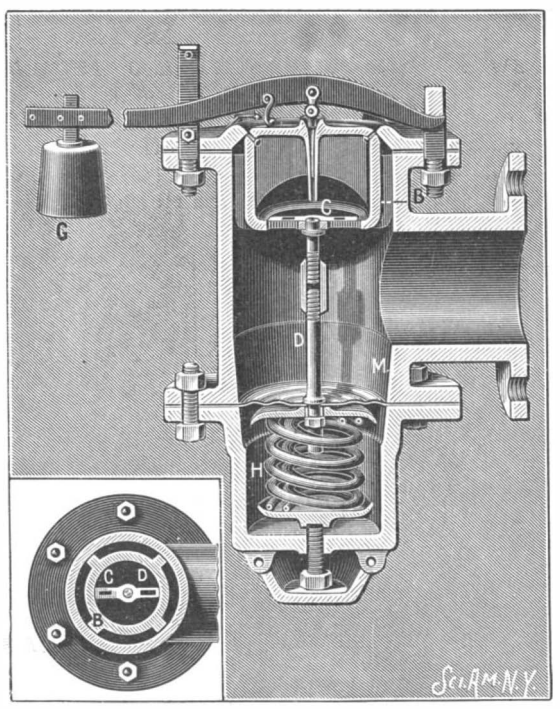
A NEW SAFETY VALVE.

We give herewith sectional and plan views of a new safety valve, for which we are indebted to La Nature.

The plate submitted to the action of the lever that carries the counterpoise, *D*, rests upon the top of a small cylinder, *B*, movable in a vertical direction in the valve box. This cylinder carries at its lower part a transverse piece, *C*, provided with two apertures, and into which is screwed a vertical rod. This latter is connected through a nut with another rod, *D*, which is fixed to a thin metallic disk, *M*, of which the circumference is clamped between the flanges of the valve box. Beneath the disk, *M*, there is a double spiral spring, *H*, which rests upon a disk that can be maneuvered by means of a screw protected by a cover hinged to the bottom of the box. The base of the latter is provided with an aperture for the purpose of revealing the existence of any leakages of steam that might take place through the disk, *M*.

The regulation of this valve is a very easy matter. The surface of the disk, *M*, is such that the pressure exerted upon it by the steam is equal to that exerted upon the cylinder, *B*, and the rod, *C*. Such pressure is obtained by regulating the tension of the spiral spring by means of the screw at the bottom. By acting upon the nut that connects the rods, *D*, the cylinder, *B*, may afterward be brought into contact with the plate submitted directly to the action of the lever carrying the counterpoise.

Such regulations will remain in force for pressures up to an amount determined by the conditions of equilibrium adopted; but it will no longer exist if the weight, *G*, be changed or the lever rendered stationary. In fact, if the weight be increased, the cylinder, *G*, will immediately descend, and the steam will escape. In like manner, if the lever be fixed, the pressure will cause the disk, *M*, to yield and carry along the cylinder, *B*, through the intermedium of the rod, *D*.



A NEW SAFETY VALVE.

A CALIFORNIA VERDE ANTIQUE QUARRY.

BY PROF. CHARLES F. HOLDER.

The question whether we are advancing in the mechanical arts and great schemes of engineering is often suggested when we are confronted with the work of the ancients. The pyramids are the most stupendous works of man ever contemplated, and there appears to be nothing new under the sun. Interest in irrigation in the Southwest dawned within the past twenty years, yet in Arizona and New Mexico there are traces of a civilization so old that the mind falters in following it back. We see beds of streams cut through miles of country, even mountain ranges, and a maze of irrigation streams crossing and re crossing the land, made unknown ages in the past years, so perfect from an engineering standpoint that the experts of to-day are emptying them of the sand and débris of centuries and using them as the arteries that shall bring new life to this fertile part of what was the old American Desert. Everywhere we follow in the steps of the ancients, and on the island of Santa Catalina there is an interesting illustration of this.

When the whites first visited Southern California, they found in use among all the mainland Indians richly shaped ollas or mortars of steatite or serpentine, while scores of articles were formed of finer grades of the same, which experts have pronounced verde antique. In almost every grave ollas were found, and hundreds had been handed down and were in the possession of the Mexican descendants of the Indians. There were flat stones, perforated to hang on pegs, quaint ornaments, sculpturings of various animals and tally stones with lines cut in them. One found by the writer at Santa Cruz Island on the breast of a skeleton bore fifty or more straight marks—which might have been the man's age — and were all that could be made out.

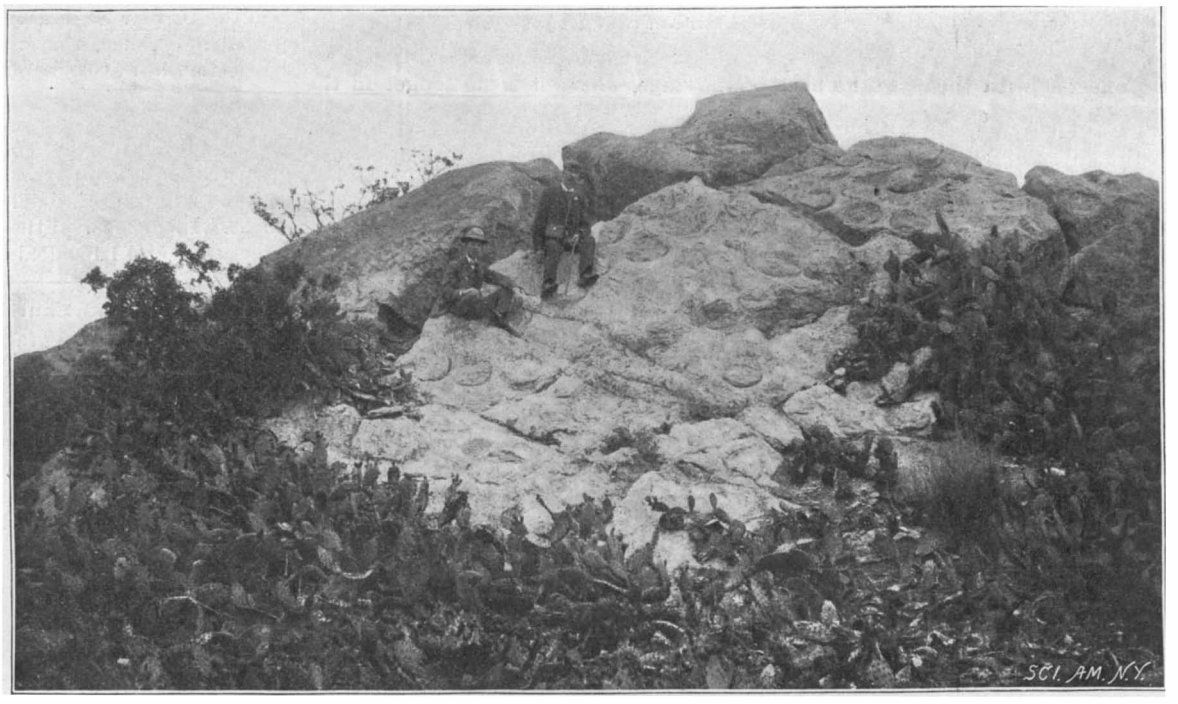
Verde antique was valuable, and a search was made for the point of supply. Finally Prof. Schumacher, of the Smithsonian, discovered it on Santa Catalina Island, which lies off Southern California, in a locality named Pott's Valley, about fifteen miles from the little town of Avalon. Prof. Schumacher found on this island a perfect treasure house, and carried to the National Museum hundreds of objects representing the ancient California islanders. All the islands of this group were inhabited by a hardy race that had camps in every cañon where there was water, and Santa Catalina abounds in kitchen middens and places where these people lived. That they were a commercial race is shown by the ollas they made, and they were the merchants who supplied the races of Southern California with their pots and mortars or ollas.

Prof. Schumacher's attention was attracted at Pott's Valley by the remarkable rock shown in the accompanying illustration, where the scars of ollas that have been broken off by the islanders are plainly seen. The rock is a lofty mass of steatite that rises in the center of Pott's Valley, now called Empire Landing. It is a land-mark from a long distance at sea, and is overgrown and surrounded with cactus and various kinds of vegetation; indeed, the cactus hides a large portion of it—an almost impregnable chevaux de frise. The scars are circular and are the marks where the round ollas were broken off. The method of work was very primitive, the natives having only slate and quartz knives to work with. With these rude implements they carved out an object the shape of a cannon ball and as large as a football. Gradually this was picked away until, finally, it hung by a narrow stem, which was broken off. The inside was then slowly dug out with the same rude tools, and in time the olla acquired the smooth and often artistic form so familiar in all the museum collections. The common shape is round, but fine mortar shapes three feet in height were not unusual.

The writer some weeks ago went over this old manufactory very carefully and found it most interesting. Here was an aboriginal manufactory — an out-door workshop—in the immediate vicinity of which were found verde antique implements in various stages from the olla just outlined to the one that had been broken off leaving the scars in the rock. In a word, the complete evolution of the olla could be traced here, especially at the head of Cottonwood Cañon, back of Pott's Valley, where verde antique crops out in ledges in every direction. On many of these can be seen the work of the native carvers, while beneath are the piles and heaps of chips as they were left centuries ago.

The early Spanish navigators, Cabrillo and Viscaino, who discovered the island three hundred years ago, described the fine canoes of the natives. These, laden with ollas, crossed the Santa Catalina channel, and the natives exchanged them for game and skins not found here. The present owners of the island, recognizing the value of the stone for commercial purposes, have followed out the mute suggestion of the ancients by establishing at Empire Landing a sawing plant, opening up a valuable quarry and one that is unique, it is believed, having no prototype at least in this country. The verde antique resembles soapstone in the crude rock and would easily escape observation. It is of different degrees of hardness, and while so soft that it can be readily worked, it has great tensile strength, its chief value being in the remarkable manner in which it can be worked. Almost every possible object can be made from it from a boat to a screw. A great value lies in its imitation when polished of the darker grades of marble; and owing to its cheapness and durability it is in demand among architects for mantles, lining, electrical slabs, and where a perfectly polished surface is required with the strength of marble. The new city hall of Los Angeles and many of the fine buildings in that city and San Francisco are finished in it, the stone taking a rich polish, abounding in greens and yellows, grays and black.

A visit to this quarry is most interesting. Here, eight or nine hundred feet above the sea, is an elaborate plant and a series of saws that are capable of cutting out hundreds of feet of verde antique a week. The rock is first bored into with a steam rock drill, a modern improvement on the flint chips of the ancient owners of the soil. A series of borings make it an easy



THE ROUND SCARS INDICATE THE PLACES FROM WHICH THE OLLAS WERE BROKEN BY THE INDIANS.

SERPENTINE QUARRY AND MILL, SANTA CATALINA ISLAND, CAL.

© 1899 SCIENTIFIC AMERICAN, INC.

matter to break off the slab, which is then by means of a huge crane lowered upon a car and run under the saws and blocked for cutting. The term saw would be misleading to the layman, as it is really a gang saw with blunt surface, and worked by the steam engine moves back and forth on the edge of the stone, not touching it, but cutting by the grinding into it of a mass of steel shot which are really the teeth of the saw. The rapidity with which this is accomplished is marvelous, and large slabs are cut out with ease—huge slabs for the side of a wall, fronts for fireplaces, aquarium sides or plates, tiles for flooring, etc. All the tanks of the Geological Station here were made from this stone, which apparently solves the question of producing a cheap but attractive aquarium and one so far as the tanks are concerned that can be built rapidly. The stone is cut into the proper shape and shipped to Los Angeles, where it is polished and applied to many purposes, and its development has become one of the valuable industries of Southern California.

A NOVELTY IN RAILROAD COLLISIONS.

The popular interest which a railroad collision possesses is, no doubt, due in part to the extraordinary manifestations of power revealed by the curious and often grotesque positions into which the various elements of the colliding trains are thrown. Although we do not see the solution of the popular conundrum as to what would happen if the "irresistible" were to strike the "immovable," we do have an opportunity to see how the huge moving mass of the locomotive and its load seeks out the line of least resistance and arranges itself accordingly. The confused entanglement which is known by the name of "railroad wreck" assumes its curious positions in accordance with strict physical laws.

The accompanying view of a wreck, which occurred recently on the Chicago and Alton Railway, was reproduced from a photograph, for which we are indebted to our esteemed contemporary The Railway Age. Our readers will understand how exceptional were the results of this collision when we explain that the coal car, upon which the locomotive is seen resting, is not one of the cars of the first train, but was the first car immediately behind the locomotive of the second train. The circumstances of the collision were as follows: Two heavy freight trains had been sent out over the lines, with about fifteen minutes' interval between them. The first train had been stopped at a tank to take water, when it was run into by the second train, which was being hauled by two engines and was running at the rate of about twenty miles an hour. The leading engine was flung to one side of the track, and, turning completely around, came to a rest headed in the opposite direction from which it had been traveling. The second engine, the one shown in our illustration, must, at the moment of the collision, have been forced into the air clear of the rails to a sufficient height to allow a forty-ton coal car, which was the leading car of the train, to shoot forward beneath it and catch it as it fell. In no other way could the relative positions, after the collision, of the engine, tender and coal car be explained. As a matter of fact, it is a common occurrence, where the locomotives meet front to front in collision, for the engines to rear squarely into the air and then fall sidewise or be thrown back upon their own trains. The mere momentum of the two engines alone would not accomplish this or fling a locomotive, as in the case of our illustration, clear into the air; but we must remember that behind the engines there is the stored-up energy of, say, a thousand-ton train moving at the rate of twenty miles an hour, which would be amply sufficient to force the locomotive clear of the rails.

The engine having elected to travel on other wheels than its own, the wrecking crew promptly accepted the suggestion, and, after backing the end of an empty coal car under the front end of the engine, as shown in the illustration, the two cars with their novel freight were hauled to the Bloomington shops for repairs. The weight of the engine is fifty tons, therefore, the total load of the car, including the coal, was about ninety tons. The bolsters were of steel, and it speaks volumes for the strength and general excellence of construction that it should have received and carried such an unprecedented burden without material injury.

Variations in Weight.

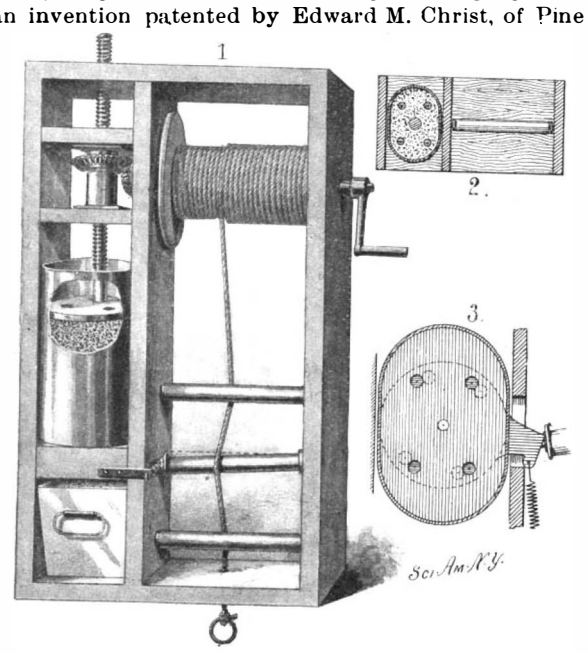
The following table, which is given by W. W. Wagstaff in the last number of Knowledge, is interesting:

Average.		lb.	oz.		lb.	oz.	
9	A. M.—Before breakfast	155	8	(losing	3	6)	during night.
10	A. M.—After "	157	4	(gaining	1	12)	
12	noon.—Before lunch	156	6	(losing	0	14)	
1	P. M.—After "	157	6	(gaining	1	0)	
5	P. M.—Before dinner	156	12	(losing	0	10)	
6¼	P. M.—After "	158	14	(gaining	2	2)	

By these figures it will be seen that an average person weighing 155 pounds loses 3 pounds 6 ounces during the night and that he gains 1 pound 12 ounces by breakfast and then that he loses about 14 ounces before lunch, that lunch adds an average of 1 pound and then he again loses during the afternoon an average of 10 ounces; an ordinary dinner to healthy persons adds 2 pounds 2 ounces to their weight. Of course excess in eating and drinking will change these figures, but they are interesting as averages.

A NEW FORM OF FIRE-ESCAPE AND LOWERING APPARATUS.

To provide a simple apparatus for lowering objects of any kind gradually, which apparatus will be particularly adapted for use as a fire-escape, is the purpose of an invention patented by Edward M. Christ, of Pine



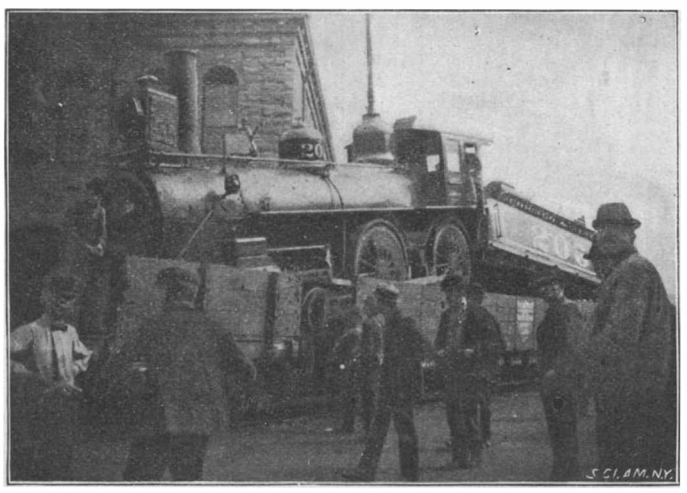
PERSPECTIVE AND SECTIONAL VIEWS OF THE FIRE-ESCAPE AND LOWERING APPARATUS.

Grove, Pa. The apparatus comprises essentially a sand cylinder with a valve outlet, in which cylinder a screw-driven perforated follower is contained, serving to regulate the rapidity of the descent.

Fig. 1 is a perspective view of the apparatus, the sand cylinder being broken away to show the follower. Fig. 2 is a cross-section taken immediately above the cylinder. Fig. 3 is a cross-section taken through the bottom of the cylinder.

The cylinder and perforated follower are supported in a frame in which a windlass is mounted. About the windlass a rope is wound, passing behind an upper and lower roller and in front of a central roller, so that it is bent out of the straight course, as shown in Fig. 1. The shaft of the windlass carries at one end a bevel gear meshing with a bevel gear on the threaded shaft of the follower. The bottom of the sand cylinder as well as the follower is perforated, providing a number of outlets for the sand. These outlets are normally closed by a valve plate, which is provided with openings adapted to register with the outlets in the cylinder bottom.

The valve plate has an extension or arm with which



CURIOUS COLLISION—COAL CAR BRINGS HOME ITS OWN LOCOMOTIVE.

a spiral spring is connected, serving to hold the valve plate in the position shown in Fig. 3. One end of the central roller is connected with the arm, the other end of which is loosely held in a bearing on the frame.

When the parts are in their normal position, the coil spring will hold the valve plate of the sand cylinder closed; but when the rope is pulled, the central roller will be thrown aside, thus swinging the valve plate, causing its openings to register with the cylinder outlets, and permitting the sand to flow into a receiving pan. The follower cannot descend until the sand begins to run, and the rapidity of its descent will be regulated by the quantity of sand dropping into the pan in a given time.

The degree of pressure on the rope automatically controls the flow of sand. The rotation of the windlass is regulated by the follower; hence the rope, with the object to be lowered, is caused to descend gradually. The rewinding of the rope will simultaneously raise the follower shaft and return the follower to its initial position.

Automobile News.

A representative of a German firm purchased one of each make of several automobiles at the National Export Exposition. He says he was attracted by the superiority of the ball-bearings and running gear of the American machines. He intimates that the superior points of the American machines will be taken advantage of, and will most probably be incorporated in their future output.

The electric automobile recently covered the distance between Atlantic City, New Jersey, to a point four miles west of Berlin, Camden County, a distance of fifty miles. The round trip was made at an average speed of 15 miles an hour, and a speed of 20 miles an hour was attained at times. The distance was carefully measured by three bicycles provided with cyclometers.

A steam plow invented by Colonel Templer, R.R., Director of the Military Ballooning and Steam Transport, has been given a trial near Aldershot, says The Mechanical Engineer, and fully carried out the objects for which it was designed. It threw up a 4-foot intrenchment at the rate of 3 miles an hour across a very rocky and rough country, Two of these machines are to be shipped at once for use with the South African field force in storming positions. The machine is so arranged that it will throw up works on either the right or left, and so powerful are the picks in front of the plowshares that rocks and stones are split to pieces and hurled upward.

The Automobile Almanac for 1900 and the Automobile Trade Directory is soon to be published by The Automobile Magazine, of New York, and will contain a large amount of valuable information interesting to automobilists, such as special reference to signs of the weather, moonlight tables, wind pressures, State ordinances, highway laws and directories of all kinds. We see from some of the advance statistics which have been furnished us that there are 688 automobiles in use in the United States, or about ten per cent of those used in France, that number being 6,546. No other country, however, can boast of as many automobiles as our own, Belgium coming next with 478; then comes Germany with 434 and Austria 403. Great Britain has 412. It seems that there are 190 manufacturers in the United States, but that of this number only twenty were in a position to deliver carriages on December 1, 1899. In France, on the contrary, there are 702 manufacturers and 1,150 dealers.

Laurel Wreaths.

It is an interesting fact that the large laurel wreath which was presented to Admiral Dewey by the United States Senate was composed of leaves grown in Africa. The wreath was about three feet in diameter and was made of silver laurel leaves mounted on a base of natural pampas grass. The leaves are pure silver gray on both sides and are delicately veined. The leaves have a white metallic luster and an exquisite softness of tone. The New York Tribune recently had some interesting facts concerning the silver laurel. It is looked upon by the natives of Africa as a sacred plant, and was used as a decoration for festive occasions. Its beauty and similarity to silver have induced collectors to send it to European countries, and the inroads on the growing stock have been so great that its exportation has been prohibited, and the leaves which now come to Europe and the United States are said to be smuggled, the price in New York being about 25 cents a leaf. By the presentation of the laurel wreath, the custom established by the Greeks many hundreds of years ago was followed, and by the ceremony Admiral Dewey became one of the host of laurel-crowned characters who figure in the chapters of history. The laurel of the ancients was dark green and was the same hardy plant which is now found in abundance in the Mediterranean region and in the Canary Islands. There were at least four shrubs and small trees known as laurel, or bay. The Laurens nobilis, or "Victor's laurel," known also as sweet bay, was one which was used by the ancients for the decoration of favorites. It was a large leathery, shining, reticulated leaf and with axillary cluster of yellowish-white flowers. The fruit is oval, bluish-black in color and about a half inch long. It is not as common in Europe as the species of cherry laurel or common laurel, which is also found in the United States.

THERE were nearly 22,000 deaths in 1898 from snake bites in India. According to The Medical News, the efficiency of the new serum is now fairly well established, but the price of a bottle, which is $1, puts it beyond the reach of most of the victims.

© 1899 SCIENTIFIC AMERICAN, INC.

HOW SCULPTORS CHANGE THE SCALE OF THEIR STATUES.

Sculptors do not always make a full-sized model of their work, but occasionally they do. At any rate, almost none of them actually do their own cutting in marble. This is intrusted to highly skilled artisans who do the work under their direction, and the sculptors superintend all of the finishing touches and even occasionally do some of the work on face and hands. The actual cutting of the stone is a most difficult process, requiring great expert skill. In case a full-sized model is made, the sculptor sends it to one of these professional marble cutters, who roughly outlines the block. The general outline is often given to the block before it leaves the marble quarries in order to save freight. The rough carving is then done by the marble cutter, who so shapes the block as to give it the general outlines of the figure to be reproduced. To effect this he drills a series of holes in the block, the depth of each of which corresponds to an external point of the statue supposed to be inclosed in the stone. After a sufficient number of these holes have been made, he removes the entire perforated portion, and what remains gives the broad lines of the statue. This focusing can be effected simply by means of a series of vertical cords and the compasses or by a special instrument called the "sculptor's cross." In the first method a rectangular frame is secured over the head or top of the statue and from it depend a series of plumb lines around the model, and an exactly similar series depend from a frame suspended above the marble to be chiseled. These lines are marked with divisions starting from the frame. In order to mark a datum point of the statue in the marble, the workman measures upon one of the guards its vertical distance from the plane of the wooden frame, and then by means of compasses its horizontal distance from the cord. This done, he places the drill near the corresponding cord of the rough block and marks upon the drill the length of the hole which he then bores until this mark comes even with the cord. The end of the hole is then at the same distance from the cord as the real point in the model, which has been ascertained with the aid of a compass. The workman then operates in the same way for a series of datum points which have been marked in the model, so that finally the workman succeeds in determining the general scale and form of the statue by means of a multitude of facets, which, when the marble is removed in flakes, gives the general form of a statue.

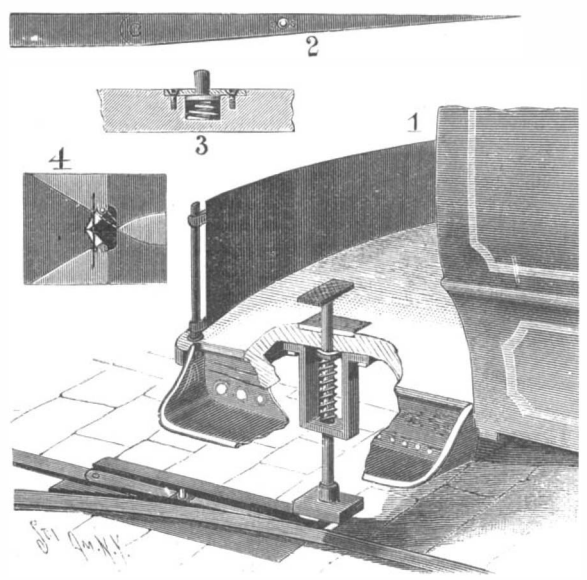
This method of procedure is advantageously replaced in many cases by an instrument called the "sculptor's cross," which is based on the principle that a point is determined by position in space when we know its distance from three fixed points. The apparatus consists of two iron rods at right angles with each other and connected by a double socket similar to that of a marking gage. The vertical rod has a slider, which holds at right angles an arm provided at its extremity with a bent point, and the lower or horizontal rod is provided with two straight points. The extremities of these three points constitute fixed points, with respect to which the positions of the different parts of the model are determined. Upon the vertical rod slides a socket, which, through a ball joint, supports the bar upon which is the exploring style. The use of the instrument will be seen from our illustration, for which we are indebted to Lectures pour Tous. The workman selects three points upon the model and three corresponding ones upon the block. The points of the apparatus are fixed once for all, so as to apply themselves either upon points upon the model, or upon the block, so that the three points may be determined with the greatest accuracy upon the rough-hewn block. After fixing the intermediate style-bar in the proper position, one of the points of the model is put in contact with the style; the screws of all the joints are tightened, and then the instrument is transferred to the block. The latter is then chiseled away until the region is reached upon which the point of the style is resting. The three fixed points rest in their places. The same thing is done for a series of points quite near each other and arranged over whole surface of the model. The mobility of the sockets and of the ball and socket joint of the stylus-carrier permits of reaching all the regions of the statue without changing the position of the points, and this insures great accuracy in the work as a whole. Finally all the contours of the figure are determined point by point. The workman becomes so expert in the use of this instrument that a sculptor can confide his model to him with a full assurance that all parts of it will be reproduced with absolute fidelity.

METHOD OF USING THE "SCULPTOR'S CROSS" IN REPRODUCING STATUARY.

GUTENBERG invented printing by using movable types, while Mergenthaler, who also marked an epoch in the art of printing by his invention of the linotype machine, virtually discarded them.

A SWITCH-THROWING DEVICE FOR CARS.

Our illustrations represent in perspective, section, and plan, a new form of switch-throwing mechanism, which is operated by the motorman or driver of a car. The device is the invention of Swan Parson, New Britain, Conn. In the platform of the car a foot-rod is vertically mounted in a bracket and provided at its lower



PARSON'S SWITCH-THROWING DEVICE FOR CARS.

end with a switch-operating plate. The foot-rod is normally held in raised position by means of a coiled spring. The switch-operating plate, as shown in Fig. 4, representing an inverted plan view, comprises two guides having obliquely-disposed edges converging toward the rear of the car. Two spring-pressed guide-fingers are pivoted in a depression at the rear ends of the guides. A pointed central guide is located in the rear of the oblique guides and is adapted for contact with pivoted fingers. When in contact with the pointed guide, the fingers and corresponding oblique guide form a straight line. The switch-tongue is provided with a projection (Figs. 1 and 3) normally spring-pressed outwardly and designed to engage the switch-operating plate on the car. In order to throw the switch the foot-rod is depressed, so that the projection on the switch-tongue engages one of the oblique guides. Let it be supposed that it engages the upper guide in Fig. 4. The oblique guide will throw the switch toward the central position until the projection comes in contact with the upper spring-pressed finger in Fig. 4. The finger will thereby be pushed back until it assumes the position shown by dotted lines and forms a continuous guide for the switch-tongue projection, with the upper oblique guide and lower edge of the rear guide. The tongue is hence gradually thrown. If the other finger were engaged by the projection, the switch-tongue would be thrown in the opposite direction. The device it is evident will throw the switch in either direction, without any difference in the operation. Even if the projection were not engaged by one of the oblique guides, the switch would still be thrown by a finger and the rear guide. The device cannot, therefore, fail in action.

Hydraulic Elevators for the Eiffel Tower.

M. Ribourt gives, in the bulletin of Société des Ingenieurs Civils, an account of the hydraulic elevators for mounting to the first and second platform of the Eiffel Tower at the time of the Paris Exposition. These elevators are now being constructed by the Fives-Lille Company, and will be installed in the east and west pillars of the tower, assuring a total of 20,000 persons per day. They are independent of each other, and the motors of the hydraulic cylinders are operated by pumps placed in the south pillar of the tower. The elevator truck supports two cabins which will hold 50 persons each. The whole, with 100 passengers, is to weigh only 15,500 kilogrammes. The twin hydraulic cylinders have pistons in laminated steel whose diameter is 400 milimeters, with a course of about 17 meters. These cylinders operate a series of pulleys, carrying the wire cables of the elevator. For the ascent, they will be fed by two high-pressure reservoirs, containing water at a pressure of 50 atmospheres. Upon the descent, the water will be forced into a low-pressure reservoir at 20 atmospheres by the weight of the elevator. The time occupied in making the trip from the ground level to the second platform, or twice 130 meters, will be but two minutes. About 500 horse power will be required for the ascent of the elevator. For the descent, a hydraulic brake is to be used.

The Automobile in Africa.

One of the first projects for the use of the automobile in Africa is that which has been recently taken up by a French company, the Compagnie de Transportation du Soudan Française. A treaty has lately been passed with the government, permitting it to engage in the transportation of merchandise in Soudan, of which the French possessions hold an important place. Between the station of Kayes, the limit of the present railroad, and the Niger, lies a stretch of country of about 300 miles, which at present has but little transportation facilities, and it is this gap which the new company proposes to fill up with the aid of automobiles, which will thus join the railroad to the right bank of the Niger. The vehicles will be of a slow-speed pattern and will follow a kind of wide grass road running through this part of the country; this road, while impracticable in the rainy season, is at other times quite well adapted for the passage of automobiles. About fifty will be needed to supply the demands of traffic. These are now being constructed by one of the large Paris factories. One peculiarity of the service is that Chinese are to be employed as conductors, these having been chosen because they are able to support the climate of the region and are more intelligent and capable than the natives.

The Current Supplement.

The current SUPPLEMENT, No. 1250, is a particularly interesting number. "The New Bremerhafen Dry Dock" is fully illustrated. The annual address of the American Society of Mechanical Engineers, entitled "Engineering in the United States Navy—Its Personnel and Material," by Rear-Admiral George W. Melville, U. S. N., is continued in this issue. "Suggestions as to Improved Appliances for Launching Ships' Boats" is by John Hyslop. "Recent Excavations in Ancient Babylonia" is an interesting and fully illustrated article. "The Development of Iron Manufacture in the United States in the Past Seventy-five Years" is a most important paper by John Fritz. "A Unique Impulse-Wheel Generating Plant" is also fully described. "The Transmission of Electrical Energy" is an illustrated article. "Geography," the address by Sir John Murray, president of the section of geography of the British Association, is concluded.

Contents.

(Illustrated articles are marked with an asterisk.)

Animals, New York's trade in wild 387
Automobile cup 387
Automobile in Africa 395
Automobile news 394
Boiler scale, relation of rainfall to 386
Canal locks 386
Carbide, explosion of 390
Cars of the Third Avenue line 389
Cartridge reloader, a* 388
Collision, railroad novelty in* 394
Consular reports, German 387
Elevators for Eiffel Tower 395
Engineering notes 391
Engines of "Wisconsin"* 385, 389
Evolution of the bedroom and bedstead 392
Fire escape, new* 394
Fossil hunting in the Rockies 390
Guns, naval, at Ladysmith* 388
Inventions recently patented 395
Iron and steel exports 387
Laurel wreaths 394
Locomotives, American 386
Porcelain, ancient American 387
Railway appliances 387
Safety valves* 393
Sculptor's cross, use of* 395
Seed distribution, free 390
Steamship line, German 388
Supplement, current 395
Switch throwing device for cars* 395
Telegraph, African transcontinental* 388
Tropical products 387
Trucks, hauling logs by motor* 388
Tunnels versus bridges 386
Verde antique quarry* 393
Weight, variations 394
"Wisconsin" engines* 385, 389

© 1899 SCIENTIFIC AMERICAN, INC.

RECENTLY PATENTED INVENTIONS.

Engineering Improvements.

DIFFERENTIAL PRESSURE GAGE.—Charles B. Heintz, Cleveland, Ohio. The purpose of this invention is to provide a pressure-indicator for engines, cylinders, pumps, by means of which it is possible accurately to determine the pressure at both ends of the cylinder or in the two pump-chambers, so that in case of variation of pressure existing errors can be rectified by making necessary adjustments in the valves. The indicator comprises a tube adapted to be connected at its ends with different pressure supplies. Pistons are fitted to slide in the tube and are spring-pressed toward the ends of the tube. A pointer indicates the variation of pressure against each piston.

FURNACE.—John L. Brown and Julius R. Tanner, Allegheny, Penn. The furnace is of that class in which the grate comprises an endless conveyer mounted to travel in the fire-box so as to carry the fuel uniformly to the point of combustion. The invention is primarily concerned with the provision of a chain conveyer. A pair of rods oblong, in cross-section, are loosely mounted in the chain. The horizontal forks of the grate-bars are mounted on the rods, the bars being arranged back to back to prevent their displacement when in position. A coupling-link connects the rods to hold them from independent movement.

Mechanical Devices.

TYPE-WRITING MACHINE.—Manuel S. Carmona, Mexico, Mexico. Two patents have been granted to this inventor for a novel type-writer. In both machines the same result is attained with somewhat different means. With only five keys, he obtains all the characters usually employed in writing, so that the machine can be readily operated with one hand. The number of combinations obtainable with these five keys is thirty-one. Two auxiliary keys are employed, by means of which thirty-one additional characters can be obtained twice over, so that the total number of possible characters is ninety-three. The spacing of the type is automatically measured, so as to correspond with each letter to be printed, enabling the form and size of the type to be varied at will. With the same machine large and small letters of English script, printing-letters, German, Greek, and Russian characters can be used. The writing is always completely visible.

Railway-Contrivances.

SEAL-LOCK.—Webster F. Traves, Nelson, Canada. This seal-lock for railway-car doors comprises a carrier moving in a casing and having a longitudinal slot, and held stationary by a part carried by one of the members to be secured. A pin is held on the carrier adjacent to the slot; and a pin in the casing enters the slot of the carrier when the carrier is held by the parts of one of the members to be secured. The two pins hold a frangible seal which is broken when the carrier is released.

Miscellaneous Inventions.

DISPLAY-CABINET FOR WINDOW-SHADES.—Henry McGinnis, La Salle, Ill. In selling window-shades at retail, the salesman has much trouble in properly exhibiting his wares. The shades, moreover, by reason of much handling, are considerably worn. The device comprises a supported shelf having a series of longitudinally extending slots in one end. Roller-brackets slide in the slots; and complementary roller-supports are mounted at the other end of the shelf. In displaying the shades, the shelf will be swung open and the shades pulled down in succession for exhibition. The body of the stock will be kept in pockets provided for it and will be taken out only to fill an order. The different styles may each be provided with a separate pocket, so that it is possible to tell at a glance how many shades of any style are on hand. The stock will also be kept clean, even the sample shades being kept in condition.

DISPLAY DEVICE.—Addison P. S. Deem and Harry L. Minsker, Charleston, W. Va. The invention provides a device which will serve as a frame for pictorial or advertising matter and a receptacle for matches, cigars, cigarettes, and pipes, or soap and combs, or pens and ink. The display-device is so constructed that the advertising matter may be changed. The device may be hung up or made to stand alone on a support.

NON-REFILLABLE BOTTLE.—Joseph Colbassani, Brooklyn, New York city. The bottle has a fragile bottom over which a plug is located. The keeper-rod of a sealing device is passed through the bottom stopper to an engagement with the fragile bottom. A latch-rod carrying a stopper is arranged for locking engagement with the keeper-rod, the end of the latch-rod projecting from the bottle neck. When it is desired to empty the bottle, the end of the latch-rod is sharply driven down, whereupon the pointed end of the keeper-rod will be forced through the fragile bottom, the opening thus made being stopped by the plug mentioned. At the same time the neck stopper is carried down, thus unsealing the neck.

BRICK-MOLD SANDER.—Elson T. Bennett, Towanda, Pa. In the ordinary brick-mold sander it is necessary to feed the molds into the machine singly, and at the proper time so that there will be no interruption in the feeding. It is also necessary to rap the boxes by hand in order to remove the surplus sand, and to feed the molds by hand. The present invention renders this work automatic, so that the feeding of the molds to the machine, rapping, and sanding are mechanically performed. The molds are supplied as may be convenient. The automaticity of the operation of this machine distinguishes it from all other brick-mold sanders.

PROJECTILE OR DART FOR BLOW-GUNS.—Joseph G. Whittier, Attica, Ind. The projectile is so constructed that it will not only pass through the gun-barrel with great velocity, but travel true to its course after leaving the barrel. Upon striking the target, the projectile will indent it or cling to it, so that a mark will be left at the point of impact.

TAP.—Charles N. Duncan, Kewanee, Ill. The tap consists of a right-angularly slotted plug, one slot being closed at both ends and the other being open at one end. A cutter-plate is inserted laterally in the plug through the closed slot, and a second cutter-plate is inserted endwise through the open slot. Both plates fit together and reciprocally lock each other and themselves in the plug. The improvement enables the tap to be inexpensively constructed. Various sizes and forms of threads can be cut with the same tap. The dies can be superseded by others or taken out and sharpened when worn.

TOOL-HOLDER.—William H. C. Harrison, Woodville, South Australia. The invention provides a means for carrying a set of independent bits in a socket, so that they cannot be mislaid. When required for use, any one of the bits can be quickly secured in the socket. The bits are hinged or attached at their tang end to a rotatable sleeve, so that when required each bit may be turned on its hinge and quickly affixed in the socket. The bit may be returned to its initial position without being detached from the sleeve. The number of bits which can be carried is limited only by the capacity of the sleeve.

FLOWER-POT STAND.—William C. Krick, Brooklyn, New York city. The stand comprises an upright, with the lower end of which legs have swinging connection. Above their pivotal points the legs have extensions, for engaging with the upright. Adjustable arms for receiving the flower-pot tray are pivoted to the upper end of the upright. The stand besides being firm and substantial, can be compactly folded for transportation.

FOUNTAIN-PEN.—Byron F. Marsh, Eustis, Fla. The inventor has devised a fountain-pen in which the feed of ink is regulated by the air-pressure within the reservoir or barrel of the pen. The pen-seat is formed with a longitudinal cavity in which an air-tube fits projecting beyond each end of the pen-seat. The air-tube fills the inner portion of the cavity in the pen-seat and is firmly engaged with the inner walls of the pen-seat plug. The outer portion of the cavity is enlarged at its outer portion to form an ink-reservoir. The air-tube is formed with a longitudinally-extending external groove providing an ink-duct, the outer portion of the air-tube serving to hold the pen-point against the inner wall of the outer portion of the seat.

WIRE FENCE.—Herman Martin, Vermilion, Ohio. The purpose of the invention is to provide a wire-fence in which the running-wires will be effectually stayed against one another, thus preventing them from spreading. This end is attained by means of a stay constructed first in the form of an angular volute with a crimp at each angle. The stay is applied to the running-wires by bending the crimps around the respective wires and securing the ends to the top and bottom stays.

BORING-TOOL.—Loron Mitchell, Augusta, Ga. The tool is designed to bore apertures and form recesses in the walls of the apertures, and is composed of a shank carrying a bit, in which shank a twisted shaft is mounted to turn. An auxiliary cutter is carried by the shaft. A twisted rod is fitted to move up and down in the shank-bore and engages the shaft whereby the longitudinal movement of the rod will rotate the shaft. The tool is very simple and by its means the operator can simultaneously bore the aperture and the annular groove in the aperture.

COMBINATION-TOOL.—Robert Newall, Quincy, Mass. The tool comprises a stock with an offset. Adjacent to the beveled side of the stock is a protractor. Two lugs project from the stock near one edge, equidistant from the center of the protractor. A blade and a clamping-screw engage slots in the stock and blade to permit the adjusting of the blade and stock relatively to each other and to clamp them together. The tool is readily transformed into an inside square, T-square, depth-gage, set-square, external miter-square, internal miter-square, height-square, inside and outside bevel-square, and external and internal center-square, and protractor.

PAPER-BOX.—Grace Bartlett, Jamestown, N. Y. This paper box is especially adapted to the transportation of flowers and is so constructed that the blossoms will not need a packing of tissue paper, moss, or other material, the arrangement of the body being such that the flowers will be prevented from moving.

TOBACCO-PIPE.—Bernard J. Tebbens, Manhattan, New York city. The pipe is provided with a stem which may be readily blown out without disturbing the tobacco in the bowl, By reason of this arrangement the stem is always free from nicotin. The stem is formed with a seat for a valve-plug, which is part of the bowl and serves to mount the bowl revolubly on the stem. The valve has three parts, by the adjustment of which the stem is opened at its heel or placed in communication with the interior of the bowl.

BINDER.—Henry T. Wise, Philadelphia, Pa. The device is especially designed for binding papers in files, wrappers, envelops, and like articles. The binder is easily manipulated to fasten the papers or documents in place in the file or wrapper, or to permit the closing and opening of the file or wrapper. The papers are arranged on a string inside of the wrapper and securely bound in place by a plate. The wrapper is held closed by passing the string around it and securing the end to a tongue.

FATTENING-COOP FOR POULTRY.—Walter S. Furnas, Lisbon, Iowa. The coop has a front wall hinged at its upper edge and swinging downward to close the coop and binding against the bottom thereof when closed. A trough extends in front of the wall, moves in and out of its path and holds the wall closed when the trough is closed.

CHIMNEY-TOP.—Charles E. Burress, 1302 N. Market Street, Wichita, Kan. The chimney-top has a top-rim portion and a main portion below, adjustable laterally, and independently of the top-rim portion and composed of sections overlapping at their adjacent edges. The base of the chimney-top may be adjusted to fit different sizes of chimneys, and the top is adapted to receive a smokestack or pipe extending upwardly so as to obtain a better draft for a low chimney.

WHEELBARROW.—William J. Freed, Eureka, Utah. The barrow comprises a pipe bent at its middle to pass about the wheel and forming side bars and handles. Cross-bars connect the side-bars. The wheel-axle is received in blocks about which clamping bars pass. The frame-bar has an opening at one side to receive the end of the axle. The principal feature of this wheelbarrow is that it rests on the ground and that it is larger, narrower, and deeper than the ordinary wheelbarrow. It is especially a mine-wheelbarrow. Since there are no legs, the construction is stronger and more stable than that usually found.

SELF-LUBRICATING SHEAVE.—Samuel Mattson, Brooklyn, New York city. The sheave is provided with a chamber containing oil and with a tube whereby the pivot or spindle is constantly lubricated while the sheave is in action. Since the feed is stopped when the sheave is idle, there can be no loss of lubricant.

ACETYLENE-GAS GENERATOR.—William E. Roles, Goldfield, Colo. The novel features of this invention are found in a water-tank arranged at one side of the gasometer and containing a generator. A water-weighted displacement plunger is supported on one side of the counterpoised gasometer-bell and is movable in the tank. The plunger rises and falls with the bell. As it sinks it forces the water in the tank up into contact with the carbid; as the bell fills, the plunger rises, causing the water to fall away from the carbid.

TROUSERS SUPPORT OR STRETCHER.—Archia L. Ross, Port Chester, N. Y. This device consists of a supporting structure in which are spaced parallel bars formed each of a single piece of wire having upwardly-extending loops for receiving a pair of buttons on the trousers. The bars also have downwardly-extending loops alternating with and projecting below the upwardly-extending loops. The trousers are properly supported and stretched so that their shape is fully preserved.

UMBRELLA-RUNNER.—Samuel E. Smith, Olean, N. Y. By means of this device the necessity of pressing the latch-spring with the thumb is obviated. The runner comprises an inner sleeve slotted for the passage of the locking-latch and surrounded by a concentric outer sleeve. To the outer sleeve a spring is secured, carrying a finger-piece moving transversely of the runner through the outer sleeve and adapted to force the spring against the latch.

PROTECTOR FOR KEYBOARD-RAILS.—Leopold Bernard, Manhattan, New York city. To prevent the scratching of the keyboard-rail by rings on the fingers of the performers, the inventor employs a sheet of flexible fabric provided with hooks or arms extending over the upper edge of the rail and having their ends inserted between the rail and the end of the keys.

INCANDESCENT-MANTLE SUPPORT.—Frank W. Poland, East Liverpool, Ohio. The purpose of this invention is to provide means for preventing the displacement of incandescent mantles by the warping and sagging of the support under the intense heat. This end is attained by constructing the burner-supporting rod with a transverse extension at its upper end. This extension projects into immediate proximity to or light contact with a stable part of the burner, so that should the rod sag or buckle, this extension will bear positively against the stable part of the burner and prevent its displacement.

Designs.

STANDARD FOR COPY-HOLDERS.—Louis Hudgin, Lochiel, Arizona Territory. The standard is shaped like an inverted U and is provided with perpendicularly-extending base-arms connected by a rod.

CAN-OPENER.—John A. Plint, Butte, Mont. The leading feature of the design consists of a handle having a depending shank and a forwardly and downwardly curved blade extending from the shank. As the operator bears down on the handle, the V-shaped back of the shank serves as a fulcrum to facilitate the operation. As the blade is properly curved the cut extends close to the edge of the can body.

MONUMENT.—Edwin O. Townsend, Zanesville, Ohio. The essential features of the design consist in a polygonal shaft with a dome cap and wings on opposite sides of the shaft.

STOVEPIPE-DRUM.—Louis S. Irgens, Valley City, N. D. The design consists of a shell having spirally-arranged tubes which retard the upward movement of the heat and warm the air passing through the tubes.

WINDOW-SHADE BRACKET.—John B. Gill, Roswell, New Mex. The leading feature of the design is found in two members at angles to each other, having a bottom plate at their junction. The bottom plate constitutes a stop which prevents the cutting of the lower sash.

GAME-BOARD.—Matthew Lecloux, Bayonne, N. J. The board has a central opening and concentric fields with defined spaces in the fields, one of the spaces in the outer field being of a different color than the other spaces. The game is played with a suitable object and is capable of affording considerable amusement to the players.

CLAMP-BAND.—Thomas W. G. Cook, Manhattan, New York city. The design consists of a flanged neck-band for lamp and gas-globe fixtures and provides a simple means for removably, yet firmly holding the globe in its socket.

Note.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

NEW BOOKS, ETC

F. Berger's French Method. By François Berger. New York. 1899. 16mo. Pp. 171.

The author is the well known teacher of the French language, and he has been particularly successful in his chosen field, so that any system which he inaugurates is sure to be interesting.

Mannheim and its Harbor. Mannheim. 1899. 8vo. Pamphlet.

This is an interesting pamphlet prepared by the statistical office of the city and is accompanied by an excellent map. The intended erection of large factories in the neighborhood of Mannheim naturally attracted the attention of foreign countries to the extraordinary economic advantages of Mannheim, and this pamphlet is intended to give the English reader an excellent idea of what has been done.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Marine Iron Works. Chicago. Catalogue free.

For logging engines. J. S. Mundy, Newark, N. J.

"U. S." Metal Polish. Indianapolis. Samples free.

Yankee Notions. Waterbury Button Co., Waterb'y, Ct.

Pocket Folding Umbrellas. Grove & Stover, Luray, Vt.

Handle & Spoke Mchy. Ober Mfg. Co., Chagrin Falls, O.

Ferracute Machine Co., Bridgeton, N. J., U. S. A. Full line of Presses, Dies, and other Sheet Metal Machinery

Inventions developed and perfected. Designing and machine work. Garvin Machine Co., 141 Varick St., N. Y.

☞ Machinery for R.R. contractors, mines, and quarries, for hoisting, pumping, crushing, excavating, etc., new or 2d-hand. Write for list. Willis Shaw, Chicago.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

Free Factory Sites.

To be Donated for Manufacturing Purposes at Erie, Pa.

One hundred acres, very desirable location, all railroads, free to factory employing one thousand men. Also ten other smaller locations, all central with good railroad facilities. Correspondence and inspection solicited. Address

Douglas Benson,
Sec'y Board of Trade, Erie, Pa.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(7771) G. R. F. asks: Can you tell me what tauric acid is, or where it can be procured? A. We do not know any such acid as tauric acid. There is a chemical called taurine, which was made first from the bile of an ox. It is an acid. This may be the substance for which you inquire. Taurine can be bought at any wholesale druggist's.

(7772) W. C. P. and others.—Inquiry has been made for further partculars regarding the use of persulphate of ammonium as a reducer for photographic plates. Make a bath of ammonium persulphate one part and water twenty or more parts. After fixing and thoroughly washing the negative to be reduced, place it in this bath and gently rock the pan till the reduction has proceeded nearly far enough. Next place the negative for a few minutes in a ten per cent solution of sodium sulphite. After this wash it well and dry. This reducing agent acts more strongly upon the silver in the deeper layers of the film, and hence reduces the thicker portion of the plate more than it does the thinner parts of the plate. This is the especial advantage claimed for it. The original article appeared in the Bulletin of the Photo. Club, Paris, 1898, 8, 232.

Answer to query 7744: If we take a clock spring of a given weight in its unwound or natural position and immerse it in a given amount of a given acid we find a definite amount of heat energy is evolved during the chemical reaction. Now, we know that after winding up a clock spring each atom of matter in the spring has had a definite amount of external energy applied to it during the process of winding and each atom of matter in the spring has been distorted from its natural position. We also know that when undergoing a chemical change, such as takes place between the metal and the acid, each atom tends to assume or return to its natural position. While undergoing this chemical change the atoms, separating from each other, are gradually coming back to their natural position, and in doing this they evolve a definite amount of heat energy. The heat evolved in this manner is proportional to the energy applied to the spring during the process of winding. Therefore, if we apply a given amount of energy to a clock spring to wind it up, and immerse it in a given strength of acid, the heat energy evolved will be that evolved by the chemical change which the spring and acid have undergone plus the heat energy evolved by the atoms when returning to their natural position. From this it will be readily seen the energy applied to wind the spring is used to straighten out each atom of matter in the metal after the acid has released the atoms from their union in the state of a metal.—A. E. D. [The answer given above is the one which has been given over and over again to this question. It is simply a speculation, based upon the doctrine of the conservation of energy. We have never seen any report of measurements which proved that a coiled spring would produce any more heat when dissolved in acid than the same spring would produce if dissolved when uncoiled. Till this is done the answer is a theoretical one merely, and does not settle the question practically. This is what we meant by our former note under No. 7744. -Eds.]

© 1899 SCIENTIFIC AMERICAN, INC.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

DECEMBER 5, 1899.

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Adding machine, E. Le Fevre 638,252
Advertising device, electric, J. Scott 638,479
Air brake, J. Shelton 638,527
Air compressor, J. H. Hopps 638,490
Air cushion, R. Aronstein 638,374
Air heating and agitating apparatus, E. F. Porter 638,272
Air under pressure, apparatus for cooling and purifying, J. Geisenberger 638,327
Animal trap, S. Ruckersberg 638,476
Asparagus bunching apparatus, G. R. Houghton 638,461
Atomizer, Cott & Loos 638,445
Atomizer and nebulizer, C. J. Seltzer 638,481
Axle box dust guard, car, N. H. Davis 638,499, 638,500
Baling press, J. N. Newman 638,644
Basket, fruit picker's, A. B. Hendricks 638,332
Battery. See Secondary battery. Storage battery.
Bearing, ball, F. W. Engels 638,222
Bearing slide, ball, C. C. Protheroe 638,373
Bedstead, sofa, W. J. Kelley 638,466
Bell, bicycle, J. Ramsay 638,420
Bell, velocipede, F. Dick 638,323
Belts onto pulleys, device for running, C. Koch 638,515
Bicycle, J. M. Baker 638,310
Bicycle brake, C. J. Pihl 638,271
Bicycle frame, H. Laviers 638,396
Bicycle pedal attachment, H. R. Sieverkropp 638,649
Bicycle pedal clip, G. A. Wheeler 638,407
Bicycle saddle coverings, binding for, W., Jr., & A. F. Meisselbach 638,519
Bicycle trolley car, J. H. Talbot 638,296
Bicycles, etc., securing device for, L. A. McCord 638,353
Bin. See Flour bin. Grain bin.
Binders, feeding device for self, W. W. Wallace 638,531
Board. See Plaster board. Whist board.
Boat, folding, E. C. F. James 638,338
Boat motor, portable, G. F. Atwood 638,542
Boiler. See Steam boiler.
Boiler tube cleaners, mechanism for operating, Forsyth & Bell 638,630
Boiler tube cleaning apparatus, W. M. Faber, Jr. 638,225
Bolt. See Building bolt.
Bolts or pipes, opening die head for cutting threads on, W. L. Tobey 638,299
Bookcase, sectional, J. L. Davidson 638,381
Bottle, non-refillable, T. Hogan 638,636
Bottles with liquids, apparatus for filling, E. K. Moore 638,467
Bowling alley and table, combined, R. Tschenda 637,486
Box. See Mail box. Miter box. Yeast powder box.
Box, Electrically controlled lock collecting or other, F. Williams 638,408
Box fastener, H. M. Sheer 638,648
Box slide forming tool, J. Hartness 638,578
Brake. See Air brake. Bicycle brake. Car brake.
Brake beam, J. G. Lawler 638,638
Brake head, shoe, and hanger, L. B. Ferguson 638,229
Bricks, etc., manufacture of, E. Willems 638,370
Bridge gate, automatic, G. E. Grover 638,633
Brush and currycomb, combined, A. M. Wightman 638,305
Buggy top joint, R. D. Buchard 638,552
Building bolt, self locking, G. H. Dyer 638,384
Building, portable, W. E. Brock 638,494
Burial casket, J. A. Shippard 638,364
Burner. See Gas burner. Lamp burner.
Burning liquid fuel in steam generators, etc., apparatus for, J. J. Kermode 638,340
Bushing, outlet, J. L. Morgan 638,350
Bust form, J. Quigley 638,400
Button collar, Austin & Craw 638,618
Cabinet for storing and handling groceries, sugar, etc., Eustice & Blair 638,569
Cabinet, kitchen, L. Arnold 638,373
Cactus burner hood, L. W. Snowden 638,650
Camera, magazine, R. A. Grout 638,455
Camera, magazine, R. H. Trumbull 638,300
Can. See Medicine can. Milk can. Oil can.
Can cutting machine, T. J. Richmond, Jr 638,597
Can top for fish or meats, D. Hennessy 638,580
Cane mill, G. W. Fisher 638,629
Car and pipe coupling, J. P. Shafer 638,403
Car brake, L. L. Logan 638,639
Car brake, J. Shelton 638,526
Car brake, F. Theilengerdes 638,656
Car buffer, railway, J. A. Hinson 638,244
Car construction, S. P. Bush 638,496
Car construction, B. O. Curtis 638,380
Car coupling, C. C. Babb 638,658
Car coupling, M. B. Giberson 638,505
Car coupling, W. F. Richards 638,357, 638,358
Car coupling, J. A. Sample 638,284
Car, protected express, H. L. Branstetter 638,551
Car side bearing, railway, J. P. Hatcher 638,240
Car side bearing, railway, C. F. Huntoon 638,336
Car truck fender, street, G. W. Butterfield 638,442
Carbureter, W. E. Cary 638,557
Card holder, Moore & Fargo 638,257
Card setting mechanism, F. H. Richards 638,275
Carpenter's gage, S. Dean 638,446
Carpet fabric, T. B. Dornan 638,410
Carriage, child's, G. F. Perley 638,670
Carrier. See Elevated carrier.
Cart, barrel, H. F. Condon 638,215
Case. See Bookcase. Cyclometer case. Show case.
Cash register, J. Sharpe 638,286
Casket support, D. W. Mumper 638,587
Chair. See Revolving chair. Tilting chair.
Chair head rest, T. G. & L. Welch 638,534
Chairs, attachment for barber's or surgical, W. T. Pinckney 638,645
Cheese cutter, E. S. Burt 638,377
Churn, T. A. Galt 638,504
Churn, V. J. Robertson 638,598
Churn and butter worker, combined, F. E. Gilmore 638,234
Churn and butter worker, combined, D. T. Sharples 638,363
Cigarette machine, J. F. Brehm 638,212
Citherns, device for facilitating playing, F. Idinger 638,248
Cloth tentering machines, driving mechanism for chains of, R. P. Winsor 638,306
Clothes pin, F. S. Graves 638,507
Clothes pounder, C. Collins 638,214
Clutch, H. T. La Clair 638,637
Clutch mechanism, A. E. Norris 638,669
Coating material for decorating and building purposes, G. F. Collantier 638,497
Coffin, M. C. H. Nicolle 638,265
Compensator, H. Bezer 638,210
Concentrating table, W. G. Dodd 638,324
Cooler. See Milk cooler.
Copying press, W. Thexton 638,608
Cork finishing machine, T. Thompson 638,528
Corset, M. L. Barcley 638,544
Coupling. See Car coupling. Car and pipe coupling. Locomotive hinged coupling. Thill coupling.
Crate, folding shipping, G. I. Remer 638,473
Cultivator, straddle row, S. D. Poole 638,671
Cupola furnace, M. Zippler 638,541
Current generator, alternating, T. H. Hicks 638,679
Curtain pole, J. M. Wilbur 638,488
Curtain, roll, L. J. Blades 638,314
Cushion. See Air cushion.
Cutter. See Cheese cutter.
Cyclometer case, A. F. Rockwell 638,401
Dental pliers, H. L. McKellops 638,468
Diaphragm, Husted & Jones 638,246
Die. See Wood compressing die.
Digester lining, J. Norton 638,267
Dish cover, collapsible flyproof, E. R. Standfield 638,651
Display cabinet, H. E. Hutchison 638,393
Ditching machine, O. R. Smith 638,291
Diving apparatus, J. E. Holland 638,335
Diving purposes, air supplying device for, F. A. Hensley 638,392
Door lock, C. E. Smith 638,404
Draught equalizer, F. F. Thill 638,609
Drinking fountain for fowls, E. Ross 638,402
Dye, oxazin, De la Harpe & Vaucher 638,576
Electric automatic elevator, H. Rowntree 638,281, 638,282
Electric generator or motor, N. W. Storer 638,482
Electric heater, E. E. Gold 638,236, 638,388
Electric lighting apparatus for vehicles, G. Heidel 638,511
Electric machine or electric motor, dynamo, G. Heidel 638,635
Electric motor controlling system, F. B. Rae 638,522
Electrical apparatus, binding post and connection for, A. Fischer 638,230
Electrical exchange, A. E. Keith et al 638,249
Electrode and making same, I. L. Roberts 638,278
Elevated carrier, P. G. Strickler 638,366
Elevator. See Electric elevator.
Engine. See Rotary engine. Turbine engine.
Engine, W. B. Brown 638,318
Engine, G. D. Bumpus 638,624
Engine safety device, Corliss, Bradbury & Washington 638,621
Engine vaporizer, explosive, B. C. Vandusen 638,529
Engines, combined distributer and regulator for, explosive, E. Brillie 638,440
Engraving machine, pantograph, H. O. Fladva 638,411
Evaporator, fruit, D. M. Ellsworth 638,325
Exercising apparatus, electric, C. L. Fortier 638,232
Fabric. See Carpet fabric.
Faucet and trimmings, basin, J. Totham 638,611
Feed table attachment, C. G. Harris 638,634
Fence post metal base, O. M. Knox 638,583
Fence stay attacher and spacer, wire, G. W. Williams 638,371
Fence stays, frame for forming wire, C. E. Wintrode 638,613
Fence tool, wire, J. E. Boynton 638,550
Fender. See Car truck fender. Ship fender.
Filter, J. Ellis 638,663
Fire escape, H. C. Karpenstein 638,465
Fire escape and alarm, combined, V. & E. V. Schirmer 638,600
Flour bin and spice cabinet, combined, D. E. Wiseman 638,433
Flushing apparatus for bowls, tanks, etc., F. Burger 638,441
Fly screen attachment, A. G. Kail 638,395
Fly trap, J. L. Boone 638,438
Fountain. See Drinking fountain.
Fruit or vegetable cleaner and grader, J. Mann 638,585
Fuel, artificial, H. M. Van Etten 638,612
Furnace. See Cupola furnace.
Gage. See Carpenter's gage.
Game, C. K. De Wolf 638,220
Game, marble, C. R. Bennett 638,436
Garden tool, D. A. Downing 638,382
Garment supporting device, M. S. Chapman 638,558
Gas burner, incandescent, Lecomte & Loeser 638,344
Gas burner, incandescent, L. Stiassny 638,652
Gas, generating acetylene, E. J. Dolan 638,448
Gas generator, acetylene, F. M. Comstock 638,444
Gas generator, acetylene, D. Genese 638,328
Gas generator, acetylene, Hold & Rose 638,459
Gas generator, acetylene, H. P. Schaefer 638,599
Gas generator, acetylene, W. W. Swett 638,483
Gas lighting or extinguishing apparatus, G. O. Lentschat 638,345
Gas, making, M. Taylor 638,485
Gas meter, C. W. Hinman 638,457, 638,458
Gas motors and gas producers, coupling, M. Taylor 638,655
Gate. See Bridge gate. Railway safety gate.
Gear cutting machine, J. S. Copeland 638,216, 638,562
Gear cutting machine, H. F. Cuntz 638,563
Generator. See Current generator. Electric generator. Gas generator.
Glycerin solutions, apparatus for concentrating crude, J. Foster 638,571
Governor, combined speed and pressure, J. W. Gardner 638,412
Grain bin, Robinson & Toltz 638,280
Grain bin subdivision, D. A. Robinson 638,279
Grain drying apparatus, Tweedale & Harvey 638,429
Grate, rocking, W. R. Park 638,355
Grate, stoking, H. Benton 638,659
Grinding machine, E. Werner 638,431
Groove cutting machine, J. B. Durst 638,450
Gun, T. W. Just 638,464
Gun carriage, W. H. Bevans 638,313
Guncotton, hydraulic conveyor for, J. Selwig 638,647
Gun, magazine, A. Alfson 638,677
Guns, extractor mechanism for breakdown, W. H. Davenport 638,322
Hammer, L. B. Knight 638,341
Handle. See Saw handle.
Harrow, E. E. Whipple 638,536
Harrow attachment, J. P. Duvall 638,383
Harrow, disk, Hunt & Friberg 638,514
Harrow, spring tooth, F. J. Henry 638,513
Harvesting or other machines, draught attachment for, W. R. Newton 638,592
Heater. See Electric heater. Water heater.
Heel attachment for boots or shoes, rubber, C. S. Ferguson 638,228
Heel compressing machine, C. H. Fogg 638,664
Heel for boots or shoes, adjustable circular, T. T. Marshall 638,347
Hide splitting machine, F. Wayland 638,368
Hides, treating, F. Wayland 638,369
Hinge for lids, thumb lever, H. J. Deitzel 638,219
Hoof parer, M. Dapp 638,218
Hose supporter, E. F. Young 638,540
Hub, vehicle, W. D. Gemmill 638,387
Hubs, pattern for casting metal, S. C. Yost 638,616
Ice making and cutting machine, C. B. Harris 638,577
Incubator, E. W. Andrews 638,309
Indicator. See Mail box indicator.
Insole slitting and channeling and lip turning machine, A. E. Johnson 638,394
Iron. See Sad iron.
Jar holder, fruit, J. H. Robeson 638,646
Joint. See Buggy top joint. Rail joint.
Joint permitting of independent rotation of the two parts, J. R. Davis 638,564
Joints, method of and apparatus for forming tubular, C. V. Burton 638,554
Key operated machines, actuating mechanism for, D. Murray 638,591
Knife. See Pocket knife.
Knotter, Hindley & Harding 638,243
Lamp, acetylene gas generating, E. J. Dolan 638,449
Lamp, acetylene gas generating, H. Eldridge 638,221
Lamp and socket, signal, C. E. Scribner 638,423
Lamp burner, J. H. Stone 638,293
Lamp chimney attachment, R. W. Walmsley 638,302
Lamp, electric arc, E. H. Belden 638,545, 638,546
Lamp, electric arc, G. Heidel 638,512
Lamp, electric arc, E. P. Warner 638,430
Lamp, electric arc, E. Woltman 638,614
Lantern, J. H. Stone 638,294, 638,653
Lasts, lock for hinged shoe, F. O. Thompson 638,297
Latch and lock, combined, J. Stevenson 638,604
Lathe, duplex chucking, J. A. Becher 638,312
Leather grating machine, Jadicke & Wiener 638,337
Leather staking machine, F. C. Kimball 638,250
Ledger or file, loose leaf, J. W. Amrath 638,208
Lift for asphalt, etc., C. L. Cummings 638,626
Lock. See Door lock.
Lock, R. S. Bowen 638,439
Locking device, desk, J. P. Fangel 638,226
Locomotive hinged coupling, Flynn & Sherman 638,231
Loom, O. W. Schaum 638,523
Loom pile forming apparatus, driving mechanism for, Barclay & Craig 638,543
Loom pitman, Raby & Spear 638,595
Loom warp stop motion, G. O. Draper 638,567
Loom warp stop motion, J. H. Northrop 638,593
Mail bag catcher and deliverer, E. Walter 638,487
Mail bag receiving and delivering apparatus, Mumford & Pinkerton 638,351, 638,352
Mail box, B. F. & A. C. Brockmeyer 638,622
Mail box indicator, W. C. & L. Lemkuhl 638,584
Mail collection sack, B. F. & A. C. Brockmeyer 638,623
Manhole frame and cover, T. P. Greger 638,574
Marker, ground, F. H. Esper 638,451
Measuring apparatus, liquid, H. Berger 638,209
Mechanical movement, pattern operated, M. E. Greenhouse 633,573
Medicine case, W. F. Barnes 638,619
Metal working machine, S. W. & S. W. Putnam, Jr. 638,274
Meter. See Gas meter. Rotary meter. Water meter.
Milk and cream, preserving, J. Russell 638,283
Milk can, C. Hobert 638,334
Milk cooler and aerator, A. L. Stone 638,406
Milker, cow, W. M. Mehring 638,640
Mill. See Cane mill. Windmill.
Mining apparatus, P. Schnetter 638,285
Mining shovel, F. D. Koch 638,681
Miter box, T. Bootsman 638,620
Mop or brush holder, H. C. Woodworth 638,539
Motive fluids, art of and apparatus for transforming energy of, N. Nilsson 638,266
Motor. See Boat motor. Tool motor.
Mower rolling bearing, lawn, E. W. McGuire 638,262
Music box and exchangeable music disk, M. Schluss 638,525
Music box sounding and damping mechanism, M. Schluss 638,524
Musical instrument, automatic, M. S. Wright 638,615
Musician's finger strengthener, V. M. Griffin 638,632
Nail, C. S. Farrow 638,386
Necktie fastener, Breves & Capouch 638,660
Oil can, J. B. Barnes 638,678
Oiling and indicator operating mechanism, A. K. Mansfield 638,518
Optical appliance, E. C. Bridge 638,316
Ore concentrating machine, T. S. Ridge 638,276
Organ, self playing, E. C. Hiscock 638,245
Packing, metallic, W. H. Prendergast 638,682
Pad. See Sales pad.
Pail, Betzoldt & Schubert 638,547
Pan. See Saucepan.
Paper boxes, machine for attaching fly strips to, C. W. Hobbs 638,413

(Continued on page 398.)

Advertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line
Back Page, each insertion, - - $1.00 a line

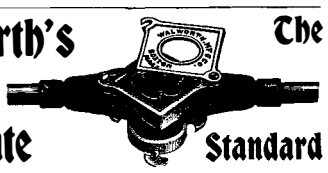
☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

Star Foot power Screw... ...cutting Lathes Automatic Cross feed
9 and 11-inch Swing.
New and Original Features
Send for Catalogue B.
Seneca Falls Mfg. Company,
695 Water St., Seneca Falls, N.Y.

ENGINE & FOOT LATHES. MACHINE SHOP OUTFITS. TOOLS AND SUPPLIES. CATALOGUE FREE. SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINNATI, O.

Walworth's Solid Die Plate The Standard



☞ *Price List on application to*
WALWORTH MANUFACTURING CO.,
128 TO 136 FEDERAL STREET, BOSTON, MASS.

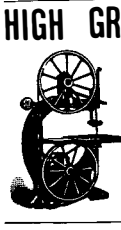
AN EXPERT'S INCOME

is within easy reach of anyone who will study "between times." Thousands of young men and women, prepared by us, cannot endorse too strongly our unequaled course of

EDUCATION BY MAIL

in Electrical, Mechanical, Steam, Mining and Civil Engineering: Metallurgy, Art, Architecture, Practical Newspaper Work, English Branches, Stenography, Machine Design and Mechanical Drawing. Low price; easy terms. **Sent free** *to those who enroll now, a complete drawing outfit worth* $11.10. Mention subjects you are interested in when writing to
The United Correspondence Schools,
154 Fifth Avenue, New York,
for Catalogue No. 33.

HIGH GRADE WOOD WORKING MACHINERY

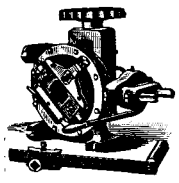


Single Machines or Complete Equipments for Any Class of Work.
Your Correspondence is Solicited.
☞ Illustrated Matter and Prices on application.
J. A. FAY & CO.
10-30 John St.. CINCINNATI, OHIO

WORK SHOPS

of Wood and Metal Workers, without steam power, equipped with
BARNES' FOOT POWER MACHINERY
allow lower bids on jobs, and give greater profit on the work. Machines sent on trial if desired. *Catalog Free.*
W. F. & JOHN BARNES CO.
1999 RUBY ST., ROCKFORD ILL.

ARMSTRONG'S No. 0 THREADING MACHINE



Can be attached to bench or post. Designed for threading the smaller sizes of pipe, iron or brass, also bolts. Has two speeds, one for pipe ⅛ to 1 inch; the other for pipe 1¼ to 2 inches, inclusive. Uses the regular Armstrong adjustable dies. Other attractive features. Send for particulars. **The Armstrong Mfg. Co.,** 139 Centre Street, New York. Bridgeport, Conn.

The Yankee DRILL GRINDER

for grinding both Twist and Flat Drills. Grinds all sized drills from ⅛ to 2¼ in. Can be set for any size in a few seconds. Gives any desired clearance. Fully guaranteed.
"Can't Grind Wrong." *Catalog free.*
G. T. EAMES COMPANY,
250 Asylum Ave., **Kalamazoo, Mich.**

SAVE ½ Your FUEL wasted up chimney.
BY USING **THE ROCHESTER RADIATOR.**
COST $2.00 AND UP.
Money refunded if not satisfactory.
Write for booklet on economy in heating homes.
ROCHESTER RADIATOR CO.,
60 Furnace Street, Rochester, N. Y.

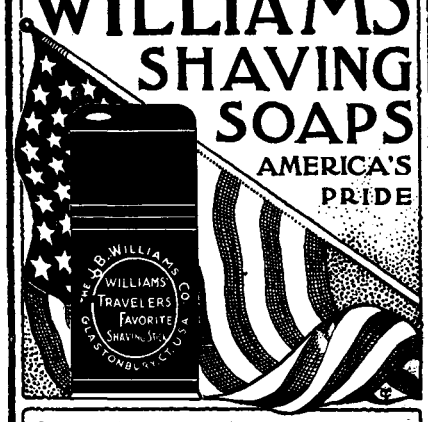
The Ness Automatic Switch Telephone System

should be in every Factory, Warehouse, School, Hotel or Public Building where quick intercommunication between floors, rooms or separate buildings is desired. Thoroughly reliable. Indorsed by the leading electrical engineers.
☞ *Send for Descriptive Booklet "S."*
The Holtzer-Cabot Electric Co., Mfrs.,
Boston (Brookline), Mass.

MATCH FACTORY.—DESCRIPTION of an English factory. SCIENTIFIC AMERICAN SUPPLEMENT 1113. Price 10 cents. For sale by Munn & Co. and all newsdealers.

You spend thousands on coal bills—but how much to save the steam? Want to know more about it?—Ask for our booklet "H" on the HEINTZ STEAM TRAP.
WILLIAM S. HAINES CO.,
136 South Fourth St., Philadelphia, Pa.

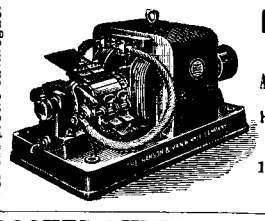
WILLIAMS' SHAVING SOAPS
AMERICA'S PRIDE



WILLIAMS' SOAPS SOLD EVERYWHERE, BUT SENT BY MAIL IF YOUR DEALER DOES NOT SUPPLY YOU.

Williams' Shaving Stick, . . 25 cents.
Genuine Yankee Shaving Soap, 10 cents.
Luxury Shaving Tablet, . . . 25 cents.
Williams' Shaving Soap (Barbers'),
Six Round Cakes, 1 lb., ... **40 cents.**
Exquisite also for toilet. Trial cake for 2c. stamp.
The **J. B. WILLIAMS CO., Glastonbury, Conn.**
LONDON: 64 GREAT RUSSELL ST., W.C. SYDNEY: 161 CLARENCE ST.

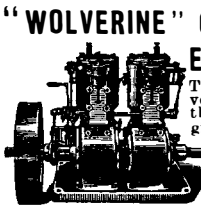
Send your business card for 160 p. 1898 catalogue.



NICKEL AND Electro-Plating Apparatus and Material.
THE Hanson & VanWinkle Co.,
Newark, N. J.
136 Liberty St., N. Y.
30 & 32 S. Canal St Chicago.

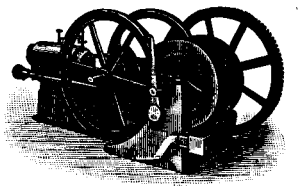
CROOKES TUBES AND ROENTGEN'S Photography.—The new photography as performed by the use of Crookes tubes as a source of excitation. All about Crookes tubes. SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **181, 189, 238, 243, 244, 792, 795, 905, 908, 1050, 1054, 1055, 1056, 1057,** also SCIENTIFIC AMERICAN, Nos. **7, 8, 10** and **14,** Vol. 74. These profusely illustrated SUPPLEMENTS contain a most exhaustive series of articles on Crookes tubes and the experiments performed with them. Among them will be found Prof. Crookes' early lectures, detailing very fully the experiments which so excited the world, and which are now again exciting attention in connection with Roentgen's photography. Price 10 cents each. To be had at this office and from all newsdealers.

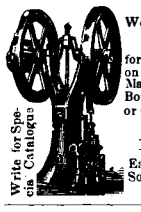
"WOLVERINE" GAS AND GASOLINE ENGINES, STATIONARY and MARINE.



The "Wolverine" is the only reversible Marine Gas Engine on the market. It is the lightest engine for its power. Requires no licensed engineer. Absolutely safe. Manufact'd by
WOLVERINE MOTOR WORKS,
12 Huron Street,
GRAND RAPIDS, MICH.

It pays to hoist with a **WITTE HOIST.** It is safe, simple, strong, and built especially for service far from factory. *Write for cat. S. A.*
Witte Iron Works Co.,
1207 Walnut St.,
Kansas City, Mo.

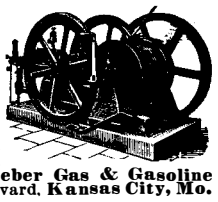




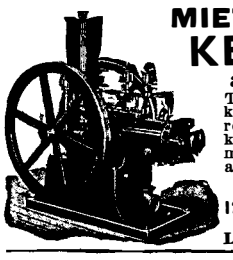
This beats Wind, Steam, or Horse Power.
We offer the **WEBSTER 2½ actual horse power GAS ENGINE** for **$150.** less 10 per cent discount for cash. Built on interchangeable plan. Built of best material. Made in lots of 100 therefore we can make the price. Boxed for shipment, weight 800 lbs. Made for Gas or Gasoline. Also Horizontal Engines, 4 to 30 h. p.
WEBSTER MFG. CO.,
1074 West 15th St., Chicago.
Eastern Branch: 38-D Dey Street, New York City.
Southern Agents: Boland & Gachwind Co., Ltd., So. Peter and Lafayette Sts., New Orleans, La.
Write for Special Catalogue.

GREAT POWER—SMALL COST!

The maximum of strength, durability and safety, with the minimum of cost that describes our **HOISTING ENGINES** for operation on Gasoline, Distillate or Crude Oil. Every part of the engine is interchangeable. Soon saves its cost in fuel alone. Both friction and geared hoist, 6 to 150 H. P. For quarries, mines and docks. *Send at once for free catalogue.*
Weber Gas & Gasoline Engine Co., 402 S. W. Boulevard, **Kansas City, Mo.**



MIETZ & WEISS KEROSENE and GAS Engine



The most economical power known. Absolutely safe and reliable. Runs with common kerosene. Perfectly automatic. Patented 1897, U. S. and European countries.
Send for Catalogues.
AUGUST MIETZ,
128-132 Mott St., New York.
MARKT & CO.,
London, Hamburg, Paris.

GERE GASOLINE ENGINES
SIMPLEST BOAT ENGINES MADE
CABIN AND OPEN BOATS
ENGINE CASTINGS, BOAT FRAMES
GEO. M. GERE YACHT AND LAUNCH WKS.
NEW CAT. FOR 4 STAMPS
GRAND RAPIDS, MICHIGAN.

20th CENTURY ELECTRO VAPOR LAUNCH
This Ideal Gentleman's Launch, elegantly finished, simple, seaworthy, safe, reliable. Seats 8. Speed 6 miles. Guaranteed for one year. Price $200.00. Order now, avoid Spring rush. Send 10 cents for handsome 76-page catalogue of Steam and Sail Yachts, Launches, Row Boats, Canoes. **RACINE BOAT MANUFACTURING CO., Box D, RACINE, WIS.**

© 1899 SCIENTIFIC AMERICAN, INC.

The Force behind the force

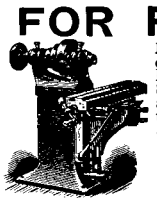
Is the educated mind which plans and directs the work of others. You can rise to a higher position without interrupting your work or leaving home. You can get

A Technical Education BY MAIL.

We have prepared successful **Mechanical or Architectural Draughtsmen, Electrical or Steam Engineers, Architects, Surveyors, Chemists, Correspondents, Stenographers** and **Bookkeepers.** Write for circular. Mention the profession you wish to enter.

The International Correspondence Schools, Box 942 Scranton, Pa.

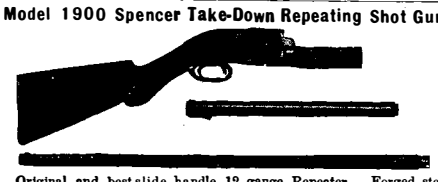
FOR FINE WORK



No machine on the market can equal our **No. 00 Hand Bench Milling Machine** with two speed counter. Spindles and bearings of hardened and ground tool steel. Arranged to take same size chucks and other attachments as fit mouth of bench lathe spindle. Traverse movement of table 7 inches. Fuller description in free illustrated booklet.

The Pratt & Whitney Co, Hartford, Conn

Model 1900 Spencer Take-Down Repeating Shot Gun.



Original and best slide handle 12 gauge Repeater. Forged steel mechanism. Over 18,000 guns in use. Sportsmen, unsolicited, write us that the **Spencer** is the **best gun on earth.** List price, with **Furst** steel barrel, $25.00. **F. BANNERMAN,** Manufacturer, 579 Broadway, N. Y. Interesting catalogue of military goods and war relics.

A SWELL AFFAIR

This is the best **Electric Scarf Pin** manufactured. Will last six months. Throws bright light 25 feet. Includes dry pocket battery, weighing six ounces. Can be lighted without any one knowing how it's done. Price, complete, by mail, $1.50. Buy one and have lots of fun.

VITALIS HUMMER, Jr., Manufacturer of Electric Novelties, **166-168 Greenwich St., N. Y.**

Buy Telephones

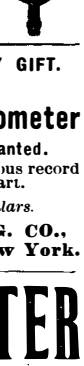
THAT ARE GOOD--NOT "CHEAP THINGS."

The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are **both good.**

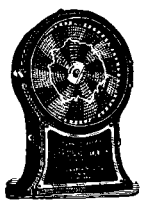
WESTERN TELEPHONE CONSTRUCTION CO.

250-254 South Clinton St., Chicago.

Largest Manufacturers of Telephones exclusively in the United States.



A DESIRABLE HOLIDAY GIFT.



DRAPER'S Recording Thermometer

Standardized and Warranted.

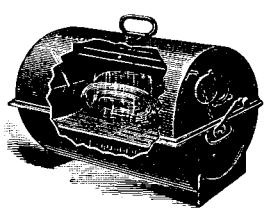
Gives a correct and continuous record in ink on a weekly chart.

☞ *Write for particulars.*

THE DRAPER MFG. CO., 152 Front Street, New York.

PHOENIX ROASTER

(PATENTED)



Will bake or roast sixty different articles saves time, labor and fuel. Indispensable for any family. Ask at your nearest hardware store. If not supplied send $1.50 in mail order to us.

Timothy Gingras, Sole Mfr., **BUFFALO, N. Y.**

Models and Experimental Work

Inventions Developed. Special Machinery.

E. V. BAILLARD, 106 Liberty Street, New York.

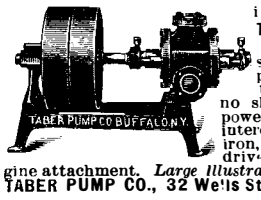
Skinner Combination Lathe Chuck

Strong and true. Best reversible jaws—easily reversed. Made of steel, case hardened. No strain on the screws. Upper section of jaw may be left off and chuck used for cutting stock. Greater capacity than any other chuck. Can be fitted with interchangeable jaws.

SKINNER CHUCK CO.

Church St., New Britain, Conn.

PERFECT - PUMP - POWER.



is attained only in the **TABER ROTARY PUMPS**

They are mechanical, simple and durable. Will pump hot or cold fluid, thin or thick. Requires no skilled mechanic Most power at least cost. All parts interchangeable. Made of iron, steel or bronze. Can be driven by belt, motor or engine attachment. *Large Illustrated Catalogue free*

TABER PUMP CO., 32 Wells St., Buffalo, N.Y., U. S. A.

DON'T LOSE THE POINT

of your pencil. Carry it in the **Improved Washburne Patent Pencil Holder.** Fastens to pocket or lapel of vest. Grips firmly but don't tear the fabric. Eyeglass Holder, with swivel hook, equally handy. By mail, 10c each. *Catalogue of these and other novelties made with the Washburne Fasteners free for the asking.*

AMERICAN RING CO., Box P, Waterbury, Conn.

Paper fringing machine, C. Schumann	638,361
Pen attachment, F. W. Cameron	638,556
Perforating machine, F. W. Hedgeland	638,242
Phonograph, L. Rosenthal	638,674
Phonographic record cabinet, C. Mueller	638,586
Phosphorus, apparatus for making, L. L. Billaudot	638,548
Photographs, method of and apparatus for making panoramic, E. Hopkinson	638,582
Pin. See Clothes pin.	
Planing machine, H. H. Thornton	638,610
Planter and fertilizer distributer, C. A. Studle	638,295
Plaster board, Blazo & Bell	638,493
Platform. See Window platform.	
Plow, H. Hansen	638,456
Plow stock, J. W. Perry	638,399
Plow, sugar beet, F. A. Wechsler et al	638,303
Pneumatic dispatch systems, receiving terminal for, C. F. Bodinus	638,409
Pocket knife and match safe, combined, J. N. Burton	638,555
Postal sheet, folding, J. A. Cook	638,561
Precious metals from their cyanid solutions, precipitation of, M. B. Zerener	638,372
Press. See Baling press. Copying press. Printing press. Soap press.	
Pressure regulator, A. Kleinfeldt	638,251
Printing machine, H. A. W. Wood	638,308
Printing machine for oil cloth, linoleum, etc., E. L. Farr	638,326
Printing press, J. B. Grosse	638,237
Propelling and steering vessels, means for, H. A. Boes	638,211
Pruning shears, H. J. Barnes	638,311
Push button, P. C. Howe	638,680
Puzzle, C. R. Bennett	638,437
Puzzle, W. Hazell	638,391
Rack. See Shoe rack. Show rack.	
Rack, J. A. McNeill	638,263
Rail joint, H. F. Smith	638,290
Railway rail chair, W. F. Gould	638,330
Railway safety gate, P. Madison	638,667
Railway signal, H. B. Taylor	638,607
Railway spikes, machine for manufacturing, O. Bolte	638,315
Railway switch, automatic, E. R. Gow	638,572
Railway track foot guard, P. J. Stockinger	638,292
Railway train schedule and time card, perpetual, R. W. Jemison	638,462
Recording apparatus, E. C. Hegan	638,579
Refrigerating machine, absorption, F. Allen	638,491
Refrigerator, O. G. Mathewson	638,255
Register. See Cash register.	
Register, W. A. Dodge	638,447
Register, E. B. Weston	638,304
Regulator. See Pressure regulator.	
Regulator and automatic shut off, Crouse & Foley	638,217
Revolving chair, M. Even	638,223
Ripping device, F. A. Reynolds	638,356
Rolling machine indicator, electric, A. P. Hine	638,333
Rotary engine, C. F. Bainter	638,375
Rotary engine, J. Fechtner	638,227
Rotary engine, C. E. Forsyth	638,570
Rotary engine, H. Migge	638,520
Rotary engine, E. H. Montgomery	638,349
Rotary meter, S. A. Chesley	638,625
Sack holder or supporter, J. W. Winegarden	638,676
Sad iron, gas heating, E. Stern	638,405
Sales pad, manifolding, Shoup & Boller	638,288
Sanitary appliance, commode, etc., D. K. Osbourne	638,269, 638,270
Sash fastener, A. A. Barr	638,492
Sash fastener, D. P. McQuiston	638,264
Sash holder, window, F. Allen	638,517
Saucepan, L. B. Wismer	638,307
Saw handle, E. B. Olson	638,268
Sawmill carriage buffer, C. E. Clark	638,213
Saw setting device, M. E. Shaw	638,287
Saxophone, P. Evette	638,385
Scale, E. E. Reisert	638,596
Scissors or shears, A. H. Dow	638,662
Screen. See Window screen.	
Screw cap, H. F. Brockmann	638,317
Screw threading machine die holder, M. C. Seren	638,601
Sealing bottles, machine for automatically, W. Painter	638,354
Secondary battery or accumulator, C. J. Reed	638,472
Shade holder, Waibel & Gross	638,530
Shears. See Pruning shears.	
Ship fender, F. G. Nielsen	638,469
Shovel. See Mining shovel.	
Shoe protector, C. M. Taylor	638,484
Shoe rack, E. E. Canedy	638,443
Show case, F. X. Ganter	638,454
Show case, J. Lehnbeuter	638,253
Show rack, folding, R. A. Miller, Jr	638,417
Shower yoke, portable, E. Melchers	638,348
Sign board, W. A. Gavett	638,233
Sign board, J. J. Woodman	638,434
Signal. See Railway signal. Telephone switchboard signal.	
Signaling apparatus, J. G. Schreuder	638,478
Signaling apparatus, electric, H. R. Taylor	638,606
Skins, machine for trimming fat from, J. A. & A. M. Haley	638,238
Snow plow, G. R. Huff	638,414
Soap press, Forster & Murdock	638,452, 638,453
Speed mechanism, variable, W. L. Schellenbach	638,359
Speed transmitting device, L. H. Nash	638,668
Spindle and bearing, G. O. Draper	638,566
Spinners, self adjusting spindle for belt, A. Haenichen	638,509
Spinning machine, A. Lepoutre	638,254
Sprayer, W. H. Allen	638,435
Spring and spring plate, N. H. Davis	638,498
Stacker, pneumatic, W. Chesterson	638,560
Stapling machine, L. L. Miller	638,256
Starting switch, multiple blade, G. S. Dunn	638,627
Steam boiler, E. McConville	638,397
Steam boiler, portable, S. Lindersmith	638,415
Steam trap, E. Hippard	638,581
Steam trap, C. H. Whitaker	638,537
Storage battery, Hanscom & Hough	638,390
Stove, Dwyer & Lane	638,502
Stove magazine attachment, B. F. Smith	638,289
Stove or range safety attachment, gas, W. De Freitas	638,501
Subirrigation system and valve, B. O. Clark	638,321
Sugar in motion, apparatus for crystalizing, E. P. Eastwick, Jr	638,568
Suppository, D. H. Murphy	638,258
Suspenders, E. T. Specht	638,428
Swine trough, F. L. Stewart	638,675
Switch. See Railway switch. Starting switch. Telephone switch.	
Switch operating mechanism, magnetic, T. F. Green	638,631
Syringe attachment, G. H. Tuttle	638,367
Table. See Concentrating table.	
Tag holder, R. F. Strobel	638,654
Tappet setter, J. P. McKeown	638,642
Tea kettle, etc., W. McAusland	638,641
Telegraph register inking device, L. E. Oehring	638,419
Telephone current supply circuit, C. E. Scribner	638,422
Telephone station toll collecting appliance, C. E. Scribner	638,480
Telephone switch, S. B. Rawson	638,471
Telephone switchboard, Morrison & Springer	638,521
Telephone switchboard appliance, J. L. McQuarrie	638,418
Telephone switchboard signal, C. E. Scribner	638,425
Telephone switchboard supervisory signal, C. E. Scribner	638,426
Terret, P. P. Wegeng	638,533
Thermal protector, C. E. Scribner	638,421
Thill coupling, L. L. Cole	638,379
Tilting chair, M. Even	638,224
Tire and rim, combined pneumatic and cushion, L. D. Munger	638,590
Tire, combined elastic and pneumatic, L. D. Munger	638,588
Tire, combined pneumatic and cushion, L. D. Munger	638,589
Tire for bicycles, self inflating, Everett & Kirkman	638,628
Tire for wheels of road vehicles, W. & L. H. Swain	638,605
Tires, device for mending rubber, C. M. Hannis	638,389
Tobacco plug shaper, Cheshire & Simcoe	638,559
Tongs, W. H. Casterlin	638,378
Tool motor, C. B. Albree	638,489, 638,490
Torpedo, T. W. Just	638,463
Toy fireworks, A. J. Lutz	638,416
Toy, trundle, J. O. Hebert	638,241
Train pipes, flexible metallic connection for, C. B. Weaver	638,532
Trap. See Animal trap. Fly trap. Steam trap.	
Tread for stairs, etc., F. W. Huestis	638,666
Tree felling device, E. Burke	638,553
Trolley wheel, J. L. Osgood	638,470
Trough. See Swine trough.	
Truck, car, J. L. Bowen	638,549
Truck, car, A. R. Green	638,665
Truck safety attachment car, L. W. Olmstead	638,398
Truck, tong, W. J. Bunyea	638,661
Truck, warehouse, J. B. Doyle	638,565
Truss, L. A. & C. Smith	638,365
Tubing, conduit, W. A. McCool	638,261
Turbine engine, I. Rigdon	638,277
Turbine, steam, J. H. K. McCollum	638,260
Valve, C. Seahorn	638,362
Vehicle, motor, W. W. Grant	638,331
Vehicle by electricity, means for propulsion of, Newman & Ledwinka	638,643

(Continued on page 399)

Cooling, Healing, Refreshing

Made from the Fresh Green Leaves of the Tasmanian Blue Gum Tree.

HYOMEI ANTISEPTIC SKIN SOAP

No Other Soap Manufactured without a Base of Fats, Grease, Oil and Alkali.

A delightful and surprising experience awaits any one who uses Hyomei Skin Soap. It is so entirely different from soaps made by the old methods, that if it were not for the beautiful, creamy lather, one would doubt that they were using soap of any description. There is no soapy smell which always follows the use of the average toilet articles; no overpowering perfume such as is used in the higher grades and which notifies each passerby that you have just taken a bath, or have some skin disease which you are trying to cure with a medicinal soap. Hyomei Skin Soap is Nature's own skin purifier. No artificial means or ingredients are used. No smarting of the eyes or tender skin results from its use. Instead, the skin is thoroughly cleansed and invigorated; all disease germs are destroyed; every pore is opened and all obstructions to perfect circulation removed. The skin soon becomes soft, smooth and free from blemish. In fact, skin diseases of any kind cannot exist where the New Soap is used daily. Send for a free sample cake of Hyomei Soap and no other will ever again be found among your toilet requisites. Sold by all druggists.

THE R. T. BOOTH COMPANY, No. 2 Third Street, Ithaca, N. Y.

A New Pair of Trousers, Free

will be given for every pair of frayed ones where

"The Guarantee" Trousers Protectors

have been used. This device will actually keep trousers from getting ragged at the bottom edges. Will preserve the shape and crease of trousers, and prevent their shriveling when wet. Applied by simply pressing on with a hot flat iron.

Our written guarantee given with each pair of Protectors, in which we agree to forfeit a new pair of trousers for every frayed pair where our Protectors have been used.

Price, 10 cents a pair at the stores. For Sample we will send you direct, postpaid, **4 pairs for 25 cents** (stamps).

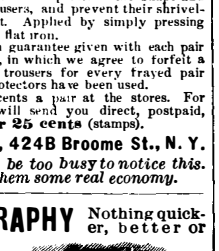
AGENTS WANTED EVERYWHERE.

Isaacs & Wittenberg, Makers, 424B Broome St., N. Y.

LADIES:—The men folks may be too busy to notice this. Order it yourself and show them some real economy.

ELECTRIC PHOTOGRAPHY Nothing quicker, better or safer for taking instantaneous photographs than the new

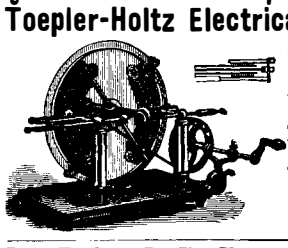
ELECTRIC FLASH LAMP.



Operated by a string, pulled from any distance. Never fails to act successfully. Can include yourself in picture and take your friends without their knowledge. No smoke or dust. Price of operating, 3 cents. Battery lasts one year. Price, **$1.50** each.

HIMMER & POTTER, 168 Greenwich St., New York.

Queen's Patent "Triple Plate" Toepler-Holtz Electrical Machine.

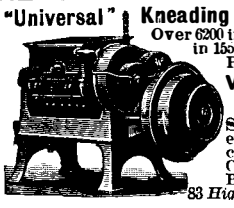


Can be used at all times of year and in all kinds of weather. Prices range from $25 to $50. ☞ *Circular on application. We carry a complete line of Electrical and Physical Instruments and Apparatus.*

QUEEN & CO., Inc. 1010 Chestnut St. Philadelphia, Pa.

PHOTOGRAPHY IN COLORS.—Formulas for producing photographs in colors by the Chassagne process. SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **1114** and **1125.** Price 10 cents each, by mail, from this office and from all newsdealers.

"Universal" Kneading and Mixing Machines



Over 6200 in use. Over 300 varieties in 150 different industries. Patented in all countries.

WERNER & PFLEIDERER

Saginaw, Mich. Builders of all kinds of Chemical Machinery, also at Cannstatt, London, Vienna, Berlin, Paris and Moscow. 83 *Highest International Awards*

A. W. FABER

Manufactory Established 1761.

LEAD PENCILS, COLORED PENCILS, SLATE PENCILS, WRITING SLATES, STEEL PENS, GOLD PENS, INKS, PENCIL CASES IN SILVER AND IN GOLD, STATIONERS' RUBBER GOODS, RULERS, COLORS AND ARTISTS' MATERIALS.

78 Reade Street. - - - New York, N. Y.

Manufactory Established 1761.

The Typewriter Exchange

1½ Barclay St., NEW YORK
124 La Salle St., CHICAGO
38 Bromfield St., BOSTON
817 Wyandotte St., KANSAS CITY, MO.
209 North 9th St., ST. LOUIS, MO.
432 Diamond St., PITTSBURGH, PA.
3 West Baltimore St., BALTIMORE, MD.

We will save you from 10 to 50% on Typewriters of all makes. *Send for Catalogue.*

A HOUSEHOLD PROBLEM SOLVED

by covering Furnace and Heater Pipes with

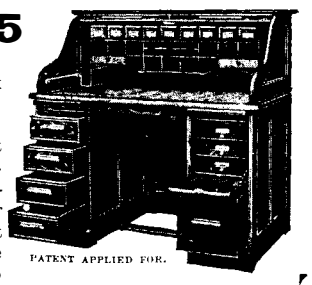
AMBLER ASBESTOS AIR CELL COVERING

Estimates and samples can be had for the asking.

Ambler Asbestos Air Cell Co., 23 Dey Street, New York.

"MACEY" DESKS.

$19.85



PATENT APPLIED FOR.

buys this "Macey" desk No. 10-H, direct from the factory, sent "On Approval," to be returned *at our expense* if not positively the best roll-top desk ever sold at the price. Worth at retail $28 to $35. *Ask for Catalogue No. "S-2."*

THE FRED MACEY COMPANY, GRAND RAPIDS, MICH.,

Makers of Office and Library Furniture.

Direct from the Factory.

The Pipe of the Century.

...THE... "MALLINCKRODT" PATENT

NICOTINE ABSORBENT AND VENTILATED SMOKING PIPE, IS THE ONLY PIPE FIT FOR A GENTLEMAN TO SMOKE.

Bowls of the **Best French Brier,** exceedingly neat and graceful in appearance, and cost no more than an ordinary pipe. There are no filthy stems to clean, and by a simple and effective construction, the poisonous nicotine juices are thoroughly absorbed before reaching the mouth, and a cool, clean and healthy smoke thereby assured. Money refunded if not satisfactory. Over 100,000 sold in 1898 alone.

Send for Illustrated Circular "S. A." and prices.

THE HARVEY & WATTS CO.,

275 Canal Street, N. Y. Station E, Philadelphia

THE ONLY CAMERA FOR ALL PURPOSES IS THE PREMO CAMERA

PRICE $5 TO $50. FOR CATALOGUE, SEND TO

ROCHESTER OPTICAL CO.

30 SOUTH ST. ROCHESTER N.Y.

BABBITT METALS.—SIX IMPORTANT formulas. SCIENTIFIC AMERICAN SUPPLEMENT **1123.** Price 10 cents. For sale by Munn & Co. and all newsdealers. Send for 1897 catalogue.

EDISON'S INK TABLET

"THE WIZARD'S TABLET"

These tablets make the only writing fluid that cannot be removed with acids, flows freely, takes copy, cheap, permanent (not aniline), send 10c. for seven oz., three colors. **EDISON CHEMICAL CO., P. O. Box 2397, N. Y.**

P. T. AUSTEN, Ph.D., *President.* F. J. MAYWALD, *Vice-Pres.* L. S. MOTT, *Sec. and Treas.*

The Austen Chemical Research Co.

Experimental Investigation of Technical Problems. Research Work for Manufacturers. Improvement and Invention of Processes and Products. Utilization of Wastes and Unapplied Substances. Reduction of Manufacturing Costs. Testing, Perfecting, Introducing and Disposing of Processes and Products. Manufacturing Formulas. ☞ *Explanatory Circular on Application.*

52 BEAVER STREET, NEW YORK.

MERITORIOUS INVENTIONS

financed or patents sold outright. Capital furnished for good enterprises at 5 per cent. Stock companies formed and influential directors procured. Stocks and bonds sold. We transact all business on commission strictly. No advance fees. PETER WHITNEY, 100 Broadway, New York.

SO SIMPLE A CHILD CAN USE THEM.

SUNART CAMERAS

26 STYLES, PRICES FROM $5.00 TO $50.00. SEND 2 STAMP FOR ILLUSTRATED CATALOGUE

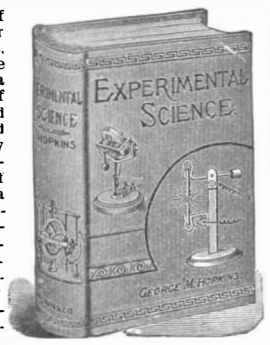
SUNART PHOTO CO. 5 AQUEDUCT ST. ROCHESTER N.Y.

© 1899 SCIENTIFIC AMERICAN, INC.

Choice Holiday Books

EXPERIMENTAL SCIENCE.

By GEORGE M. HOPKINS.



THIS is a book full of interest and value for Teachers, Students, and others who desire to impart or obtain a practical knowledge of Physics. This splendid work gives young and old something worthy of thought. It has influenced thousands of men in the choice of a career. It will give anyone, young or old, information that will enable him to comprehend the great improvements of the day It furnishes suggestions for hours of instructive recreation.

20th edition Revised and enlarged. 914 pages 820 illus Elegantly bound in cloth. Price, by mail, postpaid. **$4.00**; Half Morocco, **$5.00.**

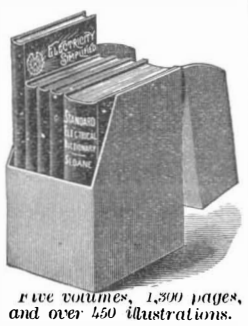
MAGIC Stage Illusions and Scientific Diversions, including Trick Photography.

This work appeals to old and young alike, and it is one of the most attractive holiday books of the year. The illusions are illustrated by the highest class of engravings, and the exposés of the tricks are, in many cases, furnished by the prestidigitateurs themselves. Conjuring, large stage illusions, fire-eating, sword-swallowing, ventriloquism, mental magic, ancient magic, automata, curious toys, stage effects, photographic tricks, and the projection of moving photographs are all well described and illustrated, making a handsome volume. It is tastefully printed and bound. Acknowledged by the profession to be the **Standard Work on Magic.**

By A. A. HOPKINS. 568 pages. 420 illus. Price **$2.50.**

A Complete Electrical Library.

By PROF T O'CONOR SLOANE.



An inexpensive library of the best books on Electricity. Put up in a neat folding box, as shown in cut. For the student, the amateur, the workshop, the electrical engineer, schools and colleges. Comprising five books as follows

Arithmetic of Electricity 138 pages, . . . $1.00
Electric Toy Making, 140 pages $1.00
How to Become a Successful Electrician, 189 pages, ... $1.00
Standard Electrical Dictionary, 682 pages, $3.00
Electricity Simplified, 156 pages. $1.00

Five volumes, 1,300 pages, and over 450 illustrations.

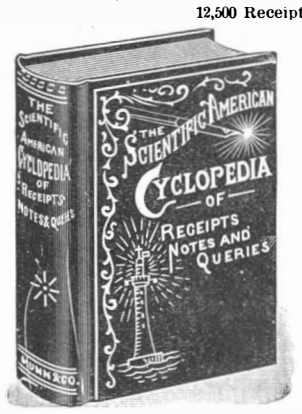
A valuable and indispensable addition to every library.

Our Great Special Offer.—We will send prepaid the above five volumes, handsomely bound in blue cloth, with silver lettering, and inclosed in a neat folding box, as shown in the illustration, at the **Special Reduced Price of $5.00** for the complete set. The regular price of the five volumes is $7.00.

THE SCIENTIFIC AMERICAN Cyclopedia of Receipts, Notes and Queries.

Edited by ALBERT A. HOPKINS.

12,500 Receipts. 708 Pages.



This splendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the SCIENTIFIC AMERICAN during the past fifty years; together with many valuable and important additions. **Over 12,000** selected Receipts are here collected; nearly every branch of the useful arts being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

Price **$5** in cloth; **$6** in sheep; **$6.50** in half morocco; postpaid.

Spirit Slate Writing and Kindred Phenomena.

By W. E ROBINSON. "Man of Mystery."

The author is a well-known authority on Magic art, with which he has been identified for twenty-five years. Many of his ideas have been utilized by American conjurors. For many years he was right hand man of the late Alexander Herrmann, and was also associated with Kellar. He was the original exponent of "Black Art," "Astarte," "Out of Sight," and kindred novelties. In his youth Mr. Robinson was brought up in the spiritualistic belief, but when he commenced to dabble in magic and understood its mysteries, the phenomena he often witnessed at séances became mere tricks and illusions. He has made it a study of his lifetime to acquaint himself with the methods employed by mediums to dupe their victims and on this account the work is of standard value.

155 Pages. 66 Illustrations. **Price $1.00,** postpaid.

☞ *Full descriptive circulars of above books will be mailed free upon application.*

MUNN & CO., Publishers,
361 BROADWAY, NEW YORK.

Vehicles, device for automatically regulating supply of liquid fuel to boilers of automobile, J. H. Bullard 638,495
Velocipede, T. H. Gledhill 638,225
Velocipede, E. G. Latta 638,343
Velocipede handle bar, R. E. Sherman 638,427
Velocipede, ice, W. Guay 638,575
Vending apparatus, coin controlled, C. W. Bankes 638,376
Ventilator, T. Edwards 638,503
Vessel, submarine, S. Lake 638,342
Violin bow, G. H. Gregg 638,508
Voting machine and booth, G. W. Trommlitz 638,683
Wagon box fastener, W. J. & D. Hamman 638,239
Washing machine, J. T. Wills 638,432
Watch plate, F. Hecht 638,510
Water closet valve, C. Perkes 638,594
Water heater, P. G. Van Wie 638,301
Water meter, automatic, J. C. Ulrich 638,657
Water purifying apparatus, A. Schantz 638,421
Water supply reservoir, portable, T. M. Jefferson 638,339
Weather strip, G. W. Golden 638,506
Weeder, E. E. Whipple 638,555
Weighing machine, F. H. Richards 638,673
Weighing machine, automatic, F. H. Richards 638,672
Wheel. See Trolley wheel.
Whist board, C. Shuman 638,602
Wick and method of manufacture, lamp, J. W. Hyatt 638,247
Winding machine, thread, J. F. Schenck 638,360
Windmill, D. W. Smith 638,603
Window platform, portable, J. Kragel 638,516
Window screen, D. B. Longwill 638,517
Window screen, E. E. Mallory 638,346
Window stop, A. I. Gonsalves 638,329
Wire, barbed, F. C. Carroll 638,320
Wire stay making device, G. W. Williams 638,538
Wire tightener, R. D. Tittle 638,298
Wood compressing die, H. J. Scheid 638,477
Wrench, E. C. Rollins 638,474
Wrench attachment, G. W. Rouse 638,475
Yeast powder box, L. Canon 638,319
Yeasting process, A. Myers 638,259

DESIGNS.

Advertising card, D. W. Bennett 31,952
Antirattler spring, G. H. Fernald 31,945
Axle for locomobiles, driving, F. E. & F. O. Stanley 31,946
Axle for locomobiles, steering, F. E. & F. O. Stanley 31,947
Axle frame, locomobile, F. E. & F. O. Stanley 31,948
Basket, fruit, W. I. Crawford 31,931, 31,932
Binding, skirt, H. A. Schaefer 31,963
Can, dairy milk, E. Mathews 31,933
Card mount, J. P. Odgers ..... 31,953 to 31,955
Chair seat, bent wood, J. H. Coffman 31,951
Cigar, N. Du Brul 31,917
Cigarette, N. Du Brul 31,916
Clasp body, H. Knepper 31,939
Clock frame, Chouffet & Isley 31,920
Clothes rack head, W. Erskine 31,937
Door plate for door hangers, W. J. Lane 31,930
Electric meter dial, H. P. Maxim 31,919
Fabric, textile, H. S. Lawson 31,962
Graphophone frame, J. W. Jones 31,921
Harness D, O. H. Muntz 31,938
Latch case, H. G. Voight 31,928
Lemon squeezer frame, A. Baumgarten 31,934
Lock and latch keeper, H. G. Voight 31,929
Mandolin body, W. H. Smaw 31,918
Mower wheel, lawn, J. A. Baker 31,944
Paper border, wall, H. Wearne 31,956
Paper, wall, H. Wearne ..... 31,957 to 31,961
Plowshare pattern, C. La Dow 31,943
Radiator, C. F. Walther 31,950
Range grate, G. Pears 31,949
Scale base frame, I. C. Koehne 31,922
Scale base member, O. O. Ozias 31,924
Scale face plate, O. O. Ozias ..... 31,92?
Scale frame, O. O. Ozias 31,923
Scale platform, O. O. Ozias 31,926
Scale supporting member, O. O. Ozias 31,925
Scraper, pan or kettle, J. M. Smith 31,935
Scraper, sink, Ladouceur & Ferland 31,936
Tool, H. Root 31,941
Washing machine casing lid, T. A. Galt 31,942
Wrench jaw, pipe, F. A. Smith 31,940

TRADE MARKS.

Albumen, preparations of albumen, and extract of meat, Toril Eiweiss und Fleisch Extract Company 33,858
Balms, Malay Remedy Company 33,844
Beer, lager, Otto Huber Brewery 33,854
Cigars, Clinton-Copeland Company 33,856
Cleansing compound for household use, E. B. Sutton 33,860
Electrical devices for body wear, A. T. Sanden 33,840
Face bleach, E. J. Crane 33,843
Ferruginous preparation, Nicolay & Company 33,849
Flour, wheat, Dodwell & Company 33,857
Game chips, New York Consolidated Card Company 33,836
Groceries, certain named, I. R. Howard & Company 33,859
Leather and boots and shoes, C. T. Sampson Manufacturing Company 33,838
Leather and footwear made of leather, Hine & Lynch 33,837
Liniment, W. H. Eldred 33,852
Liniment for certain named diseases, A. Beckham 33,851
Medals and badges, College and Commissariat of the Holy Land 33,835
Medicinal beverage, certain named, Star Chemical Company 33,853
Medicinal compound for certain named diseases, J. N. Greenlee 33,848
Nut food, Atlantic Peanut Refinery 33,856
Paint pigments, Lowe Brothers Company 33,862
Paints and fresco coloring, J. P. R. James 33,861
Paper, carbon, Mittag & Volger 33,832
Paper, carbon, Tower Manufacturing and Novelty Company 33,833
Pharmaceutical preparations, Day & Weller 33,850
Remedy for certain named diseases of cattle, O. O. Hattervig 33,847
Remedy for skin eruptions, Goodwill Chemical Company 33,842
Spy glasses and double opera glasses, J. B. A. Baille 33,834
Toilet preparation, F. W. Blanchard 33,845
Toilet preparations, certain named, W. G. Fletcher 33,846
Umbrellas and parasols, Allison & Lamson 33,839
Wires and cables, certain named, Hazard Manufacturing Company 33,841

LABELS.

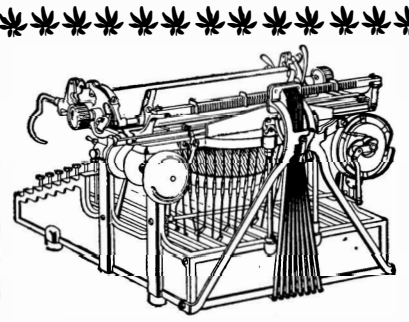
"Blue Grass Export," for lager beer, Lexington Brewing Company 7,225
"Everlasting Preservative for Eggs," for a preservative, F. Guiltman 7,227
"Mason's Challenge Paste Stove Polish," for stove polish, James S. Mason & Company 7,228
"Royal Gem," for coffee, Whaley & Dashiell 7,226
"Stag Stogies," for stogies, G. H. Martin 7,224

PRINTS.

"Huyler's Cocoa and Chocolate from the Bean," for cocoa and chocolate, Huyler's 187
"Laxative Fruit Juice," for a laxative, J. Von Werthern 188
"The Reader," for sewing machines, Singer Manufacturing Company 185
"The Writer," for sewing machines, Singer Manufacturing Company 186

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York. Special rates will be given where a large number of copies are desired at one time.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.



ASK FOR DESCRIPTIVE TABULATOR CATALOGUE.

The Smith Premier
Tabulating and Billing Machine.
An Ever Ready, Effective Time and Labor Saving Device ...for Premier Users.
Simplifies Bill Making and writing figures of different denominations in columns.
It in no way interferes with the typewriter for usual lines of work.
The Smith Premier Typewriter Co.
SYRACUSE, N. Y., U. S. A.

FOR SALE Two Steam Engines built by The Watts Campbell Co., of Newark, N. J. Each engine consists of 2 horizontal condensing Corliss Engines coupled to one shaft, with a vertical air pump driven from crank pin. The smaller engine has two 28 in. cylinders, 60 in stroke. Belt wheel is 25 ft. dia. by 91 in. face. Gross weight of engine is about 202,000 lbs. The larger engine has two 32 in. cylinders, 60 in. stroke. Belt wheel is 26 ft. diameter by 114 in. face. Gross weight is about 247,000 lbs. These engines are to be taken out to make room for others of greater power. They can be seen in operation now, and will probably be ready for delivery about February, 1900. Apply to **The Clark Thread Co.,** P. O. Box 154, Newark, N. J.

FOR SALE—One 20 horse power horizontal, tubular boiler with pumps, inspirator, heaters, etc., and one Armington & Simms 50 horse power engine, all in first class condition. Addr., H. L. M. C., Box 773, New York.

For Sale Patent No. 637,431. A mould to run into and around corners, in Plaster Cornice Work, making a clean and true miter, which has now to be worked in by hand. A money maker. For particulars, Address **A. J. TOBIE,** 8th St., Williamsbridge, N. Y.

Acetylene Burners.
Samples, ¼ to 1 foot, 25c. each.
A new burner for **STEREOPTICONS.**
Highest C. P. possible.
State Line Talc Co., Chattanooga, Tenn.

50 YEARS' EXPERIENCE
PATENTS
TRADE MARKS
DESIGNS
COPYRIGHTS &c.

Anyone sending a sketch and description may quickly ascertain our opinion free whether an invention is probably patentable. Communications strictly confidential. Handbook on Patents sent free. Oldest agency for securing patents.

Patents taken through Munn & Co. receive *special notice*, without charge, in the

Scientific American.

A handsomely illustrated weekly. Largest circulation of any scientific journal. Terms, $3 a year; four months, $1. Sold by all newsdealers.

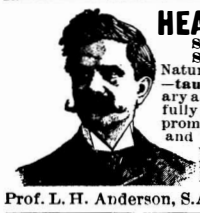
MUNN & Co. 361 Broadway, **New York**
Branch Office, 625 F St., Washington, D. C.

YOU CAN MAKE $100. A WEEK!
OWN YOUR OWN SHOW. COMPLETE OUTFIT—$100.
LIFE MOTION FILMS & MACHINES.
GREAT PASSION PLAY & 500 OTHER SUBJECTS
ILLUSTRATED CATALOGUES FREE.
S. LUBIN, LARGEST MFR. PHILADELPHIA, PA.

Calcium Carbide
FOR EXPORT.
E. A. NERESHEIMER,
35 Nassau St., New York City.

DON'T BE HARD UP $2,000 A YEAR EASY
Gold, Silver, Nickel and Metal Plating. Gents and Ladies at home or traveling, taking orders, using and selling **Prof. Gray's** Platers. Plates Watches, Jewelry, Tableware, Bicycles, and all metal goods. No experience, heavy plate, modern methods. We do plating, manufacture outfits, all sizes. Guaranteed. Only outfits complete, all tools, lathes, materials, etc., ready for work. **We teach** you the art, furnish secrets and formulas FREE. **Write today.** Testimonials, samples, etc. FREE. G. GRAY & CO., PLATING WORKS, 8, Cincinnati, O.

REVERSING STEAM TURBINE.—PARSON'S recently perfected turbine for boats. Illustrations showing details. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1158.** Price 10 cents, by mail, from this office, and from all newsdealers.



HEALTH AND WEALTH
SCIENTIFIC TRUTHS and STARTLING FACTS.
Natural Healing—a paying profession—**taught by mail.** Anyone of ordinary ability can easily learn & successfully practice it. Every known disease promptly relieved. Diplomas granted and a complete library together with paying advertising matter furnished. Act quickly. Golden Harvest sure. Circulars free.
Prof. L. H. Anderson, S.A. 2129, Masonic Temp. Chicago.

The WOODEN HEN

A high-class self-regulating incubator on a small scale. Fifty egg capacity. Heat, moisture and ventilation automatically and perfectly controlled.
Price only $7.
Send for the **Wooden Hen Book;** mailed free, together with a book about the **EXCELSIOR INCUBATOR,** to those who name this paper.
GEO. H. STAHL, Quincy, Illinois.

Draughtsmen wanted on Mill Machinery and Machine Tools. Apply Bethlehem Steel Co., South Bethlehem, Pa.

WANTED Box Nailer to drive at least eight No. 14 large head wire nails, 5/8 in. or longer. Address Palmetto Fibre Co., Frederick, Md.

TURBINES ☞ Send for Circular "M." JAS. LEFFEL & CO. Springfield, Ohio, U. S. A.

ICE MACHINES, Corliss Engines, Brewers' and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton Street, Milwaukee, Wis.

Mechanical Engineer. To take charge of machine shop for building all kinds of machines. Must be draughtsman. State past experience. Address, S. M. G., Box 773, N. Y.

D'AMOUR & LITTLEDALE MACHINE CO.
130 WORTH ST. NEW YORK.
Machinery, Tools, Patterns, Models.

$1,500 will buy a most promising electrical engineering and manufacturing business centrally located in New York City, an exceptional opportunity for technically educated young man. Dynamo, P. O. Box 773, N. Y.

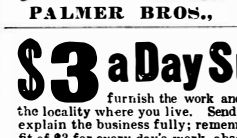
Situation Wanted by a man (34) who has filled nearly every position in an office of a large manufacturing concern, preferably in the metal specialty trade. Addr. W. H. L., Box 773, N. Y.

STEEL TYPEWRITER TYPE
TYPE WHEELS. MODELS & EXPERIMENTAL WORK. SMALL MACHINERY NOVELTIES & ETC. NEW YORK STENCIL WORKS 100 NASSAU ST. N.Y.

FOR STEREOPTICONS AND SLIDES
Moving Picture Machines and Films, write **Williams, Brown & Earle,** 920 Chestnut St., Philadelphia, Pa.

UNITED STATES PATENT or license of a safety appliance for high speed steam engines. Established in England and on the Continent. Easily applied to existing engines. **W. H. C.,** Box 773, New York.

D. L. HOLDEN
1336 BEACH ST. PHILADELPHIA PA.
SOLE MANUFACTURER
REGEALED ICE MACHINES
SEE FIRST PAGE SCIENTIFIC AMERICAN SEPT. 2. 1899



PALMER Stationary and Marine Gasoline Engines and Launches, Motor Wagon Engines, Pumping Engines.
☞ Send for catalog.
PALMER BROS., MIANUS, CONN.

$3 a Day Sure Send us your address and we will show you how to make $3 a day absolutely sure; we furnish the work and teach you free; you work in the locality where you live. Send us your address and we will explain the business fully; remember we guarantee a clear profit of $3 for every day's work, absolutely sure, write at once. ROYAL MANUFACTURING CO., Box 1 1. DETROIT, MICH.

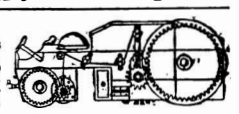
310 First Premiums
Awarded to the **PRAIRIE STATE INCUBATOR.** Guaranteed to operate in any climate. Send for catalogue.
PRAIRIE STATE INCUBATOR CO. Homer City, Pa.

POULTRY PAPER, illustrated, 20 pages, 25 cents per year, 4 months' trial, 10 cents. *Sample Free.* 64-page practical poultry book free to yearly subscribers. Book alone, 10 cts. *Catalogue* of poultry books free.
POULTRY ADVOCATE, Syracuse, N. Y.

LIFE PRODUCERS
SUCCESSFUL INCUBATORS.
LIFE PRESERVERS
SUCCESSFUL BROODERS.
All about them in our 148-page catalogue. Mailed for 6 cents in stamps.
DES MOINES INCUBATOR CO., Box 75 Des Moines, Ia.

INCUBATORS THE CYPHERS.
One Style Only, OUR BEST.
Warranted to last **Ten Years** without repairs and to **out-hatch** during three trials any other incubator—bar none; **THIS OR YOUR MONEY BACK. Built for business—sold on honor.** 16-page illustrated circular and price list **FREE.** Poultry Manual and Catalogue No. **134,** (160-pages, 8x11in.) entitled, "How to make money with Poultry and Incubators" sent postpaid for 15 cts. in stamps—**worth dollars.** Address nearest office.
CYPHERS INCUBATOR CO.,
Boston, Mass. Wayland, N. Y. Chicago, Ill.

FOR SALE OR ROYALTY.
Patent Right No. 615,537. The most complete Street Sweeper ever invented. Gathers and selects the fine from the coarse. Dustless, simple and durable. A fortune for the right man or a company. Address A. C. A. DUPUY, 1702 La Harpe St., New Orleans, La.



GUNS
Send stamp for illustrated catalogue, now ready.
The Folsom Arms Co., Dept. A, 314 Broadway, New York.

To SUCCEED
in the poultry business it is only necessary to give close attention to details and follow the instructions in our **20th CENTURY POULTRY BOOK.** It tells in the start what it would take 10 years to learn.
RELIABLE INCUBATORS AND BROODERS are used all over the U. S. and in 51 foreign countries. Book mailed on receipt of 10c.
Reliable Incubator & Brooder Co. Box B105, Quincy, Ills.

Brass Band
Instruments, Drums, Uniforms & Supplies. Write for catalog, 445 illustrations. **FREE;** it gives Music and Instructions for New Bands.
LYON & HEALY,
58 Adams St., CHICAGO.

THE HARRINGTON & KING PERFORATING CO.
PERFORATED METALS OF EVERY DESCRIPTION FOR ALL USES
N. UNION ST. CHICAGO
SCREENS OF ALL KINDS

© 1899 SCIENTIFIC AMERICAN, INC.

THOROUGH INSPECTIONS

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

AND INSURANCE AGAINST LOSS OR DAMAGE TO PROPERTY AND LOSS OF LIFE AND INJURY TO PERSONS CAUSED BY

STEAM BOILER EXPLOSIONS

J. M. ALLEN, President — W. B. FRANKLIN, Vice President
J. B. PIERCE, Secretary — F. B. ALLEN, 2d Vice President
L. B. BRAINERD, Asst Treas. — L. F. MIDDLEBROOK, Asst Sec'y

A Winter's Ride

in the clear frosty air is always enjoyable, but never better appreciated than when the conveyance is a

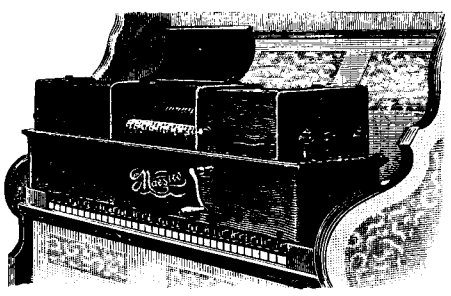
WINTON MOTOR CARRIAGE

in that, one feels the delightful luxury of rapid motion that is easily increased or diminished at will. A safe, durable, noiseless, elegant yet economic vehicle. Hydro-carbon system.

Price $1,000. *No Agents.*

☞ *Write for Catalogue of particulars*

THE WINTON MOTOR CARRIAGE CO., Cleveland, Ohio.



This Little Instrument

plays the Organ better than most people after ten years instruction and practice. It is called

The Maestro

because it is the master player.

It will play **Hymns, Popular Songs, Church Voluntaries, Dance Music, Overtures, etc.,** on **Any Good Cabinet Organ. Price $40.**

☞ *Profitable business for good agents.*

THE MAESTRO COMPANY, Elbridge, N. Y., U. S. A.

OVER 25,000 IN USE.

ILY PUT ON. HAS PROVED PERFECT
RELIABLE. FULLY GUARANTEED.

...cing becomes so safe and easy you do it every chance you get. Your feet on the pedals gives perfect control of the wheel. Ladies' skirts keep down when coasting. You can adjust it to any make of cycle.

Our **Acetylene Bicycle Lamp** is superior in construction to any made.

Illustrated pamphlet giving detailed information regarding Brake and Lamp, sent on application.

ECLIPSE BICYCLE CO.

Box X, ELMIRA, N. Y.

SUBMARINE TELEGRAPH.—A POPular article upon cable telegraphing. SCIENTIFIC AMERICAN SUPPLEMENT 1134. Price 10 cents. For sale by Munn & Co. and all newsdealers.

Warm Extremities, Warm all over.

Warm, Strong, Durable, Handsome, are our $3 Large Gauntlet Black Fur Gloves, by mail prepaid. The same remarks will apply to our Dollar-quarter genuine Mocha Kid gloves in all colors for women, and our Dollar-half, Seventy-five and Two-dollar unlined and silk-lined Mocha and Reindeer gloves for men.

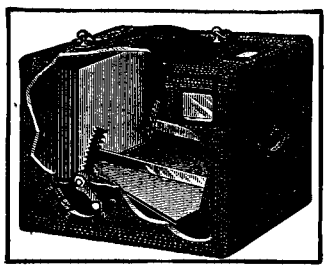
Our enlarged illustrated booklet "Glove Pointers" may be had free by mentioning this paper. It will give you a lot of information about dress, driving and work gloves and mittens.

In Black Galloway and Frisian Fur Coats and Robes we are headquarters. Get our "Moth-Proof" booklet. Also coon, dog, wombat, Russian calf coats.

In Custom Fur Tanning of all kinds of hides and skins; Rug and Robe work; Taxidermy and Head Mounting we are at home: Get our custom tan "Folder."

The Crosby Frisian Fur Co., 116 Mill St., Rochester, N.Y.

The Adlake Camera



With its many superior attractions to amateurs is recommended as a most acceptable

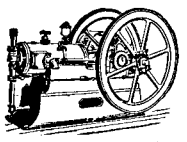
Holiday Gift.

Adlake Repeater, rapid action magazine, $5.50 and $8.00.
Adlake Regular, with 12 light proof plate holders, $10.00.
Adlake Special with 12 light proof aluminum plate holders, $12.00.
Sent express prepaid to any part of U. S.
Send for catalogue.

THE ADAMS & WESTLAKE CO., 108 Ontario St., Chicago

CHARTER Gasoline Engine

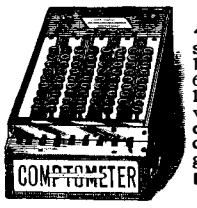
USED ANY PLACE BY ANYONE FOR ANY PURPOSE



Stationaries, Portables, Engines and Pumps.

☞ State your Power Needs.

CHARTER GAS ENGINE CO., Box 148, STERLING, ILL.



ALL ARITHMETICAL PROBLEMS solved rapidly and accurately by the Comptometer. Saves 60 per cent of time and entirely relieves mental and nervous strain. Adapted to all commercial and scientific computation. Why don't you get one? *Write for pamphlet.*

FELT & TARRANT MFG. CO. 52-56 ILLINOIS ST. CHICAGO.

Scales All varieties at lowest prices. Best Railroad Track and Wagon or Stock Scales made, Also 1000 useful articles, including Safes. Sewing Machines, Bicycles, Tools, etc. Save Money. Lists Free. CHICAGO SCALE CO., Chicago. Ill.

PAYS to write for our 256-page free book. Tells how men with small capital can make money with a Magic Lantern or Stereopticon. McALLISTER, Mfg. Optician, 49 Nassau St., N. Y.

HIGH GRADE FOOT POWER LATHES
W. P. DAVIS, ROCHESTER, N. Y.

ASBESTOS FIRE-FELT COVERINGS
PURE ASBESTOS, ABSOLUTELY FIRE PROOF.
REPLETE WITH AIR CELLS, PERFECT NON-CONDUCTORS.
STRONG, LIGHT, FLEXIBLE, EASILY APPLIED.
MADE IN SECTIONS THREE FEET LONG.
FIT STANDARD PIPE ½ INCH TO 16 INCHES.
H. W. JOHNS MFG CO.
NEW YORK · CHICAGO · PHILADELPHIA · BOSTON
MAKERS OF
ASBESTOS MATERIALS. LIQUID PAINTS & STAINS
ROOFING MATERIALS. ELECTRICAL MATERIALS.

NEW ENGLAND WATCHES.

are for sale by

ALL JEWELERS,

and comprise all sizes and styles from the low priced nickel to the dainty jeweled and enameled designs for ladies' wear.

Every watch is tested thoroughly before leaving the factory, and every watch is guaranteed for quality and faithfulness of its performance as a timekeeper.

THE NEW ENGLAND WATCH CO., WATERBURY, CONN.

Send for catalogue.

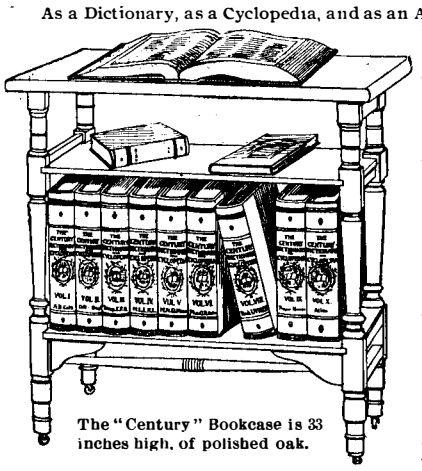
JESSOP'S STEEL THE VERY BEST FOR TOOLS, SAWS ETC.
Wm JESSOP & SONS Ltd 91 JOHN ST. NEW YORK

PRINTING INKS

The SCIENTIFIC AMERICAN is printed with CHAS ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York

The 10 Best Books for ENGINEERS

As a Dictionary, as a Cyclopedia, and as an Atlas the "Century" is universally admitted to be the greatest ever compiled—and the latest. What we want you to know, is that it contains a complete and accurate summary of trade-knowledge, etc., that has never before been gathered in any one work—indeed, much of it will not be found even in the special hand-books of the various arts and sciences.



The "Century" Bookcase is 33 inches high, of polished oak.

It fully takes the place of every other reference work—that's the simplest way of putting it. Take for instance *Engineering* and the thousands of terms that come under that head. In "The Century" each one is in its own place—one doesn't have to read through a long treatise on the general subject, to find or miss the single fact that is wanted just then. That's the way the old-line reference works were made.

Instead one turns directly to "Twin Cylinder," for example, and finds a detail drawing with complete description of parts—and a comprehensive article with cross references that carry the reader still more minutely into the parts and the workings of this particular piece of machinery, all without cumbering of unnecessary detail, all without loss of time, and absolutely without fear of misstatement or omission.

THE CENTURY DICTIONARY AND CYCLOPEDIA AND ATLAS in its newly revised and completed 10 volume form can be bought at half price and paid for in little monthly installments that figure only 10 cents a day.

The Wanamaker Store has secured an entire edition of this greatest of all reference works, and by so doing made possible the great price reduction and the easy payment system.

Write us for particulars of the offer (mention SCIENTIFIC AMERICAN, please), and we'll mail you illustrated specimen pages, sample map, description of bindings, and all that, and also a special pamphlet showing what the "Century" contains for Architects, or for Electricians, Engineers, etc. Tell us, of course, which of these you're most interested in, as they are separate pamphlets.

THE CENTURY DICTIONARY & CYCLOPEDIA & ATLAS

Here are a very few of the A's that will interest Engineers, etc. Hardly a quarter of the headings under this single initial. **Most of them** are accompanied with authoritative illustrations—all are treated concisely and completely.

abacus
" major
abanurus
abandonment
" of railways
abatis
Abert, J. J.
abnerval
aboard
" all
about-sledge
abreuvoir
absorb
" absorbing well
absorptiometer
abstrich
abutment
abutment-crane
acceleration
accelerator
accent
accommodation
" train
accouplement
accumulation
" of power
accumulator
" hydro-pneumatic
acetylene
acid
acid-yellow
acierage
acierate
acieration
acorn-cup
acrospired
actinic
" process
action
" of a moving system
" back
" single
actioner
actinism
actual
" energy
addendum
" circle
" of a tooth
adding-machine
additor
adhesion
" car
" of wheels to rails
adiabatic
" curve or line
adit
adjusting-screw
adjusting-tool
adz, adze
" hollow
adz-plane
æolipile
ærate
" ærated bread
" ærated waters
" ærating filter
ærator
ærial
" car
" telegraphy
" railway
æroclinoscope
ærodynamics
ærometer
" barometrical
æremetric
æremetry
ærophone
ærophore
æroplane
æthrioscope
after-damp
after-gland
after-hood
aging
aggregate
aggregate path
" velocity
agitator
aiguille
air-bag
air-balloon
air-bath
air-blast
air-box
air brake
air-brick
air-bridge
air-brush
air-bucket
air-camel
air-carbureter
air-chamber
air-endway
air-engine
air-gage
air-gas
air-gate
air-governor
air-grating
air-gun
air-heading
air-hoist
air-holder
air-hole
airing-stage
air-injector
air-jacket
air-level
air-lock
air-locomotive
air-logged
air-machine
air-manometer
air-meter
airohydrogen
airohydrogen-blowpipe
airometer
air-pipe
air-pit
air-poise
air-port
air-pump
air-pump air and circulating pumps
air-pump bucket
air-pyrometer
air-regulator
air-reservoir
air-soller
air-space
air-spring
air-stack
air-strake
air thermometer
air-tight
air-tight stove
air-trap
air-trunk
air-tube
air-valve
air-vessel
aitchpiece
ajutage
alabastrine
" positive
alarm
" check-valve
" electric
" low-water
alarm-clock
alarm-compass
alarm-funnel
alarm-gage
alarm gun
alarm-lock
albata
Albert, Joseph
albertype
albion-metal
albo-carbon
" light
albolite

NEW YORK. JOHN WANAMAKER

© 1899 SCIENTIFIC AMERICAN, INC.